

# DUBAI a Micronation Economy style and Africa

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# Dubai

Dubai is situated on the Persian Gulf coast of the United Arab Emirates and is roughly at sea level (16 m or 52 ft above). The emirate of Dubai shares borders with Abu Dhabi in the south, Sharjah in the northeast, and the Sultanate of Oman in the southeast. Hatta, a minor exclave of the emirate, is surrounded on three sides by Oman and by the emirates of Ajman (in the west) and Ras Al Khaimah (in the north). The Persian Gulf borders the western coast of the emirate. Dubai covers an area of 1,588 sq mi (4,110 km<sup>2</sup>), which represents a significant expansion beyond its initial 1,500 sq mi (3,900 km<sup>2</sup>) designation due to land reclamation from the sea.

Dubai lies directly within the Arabian Desert. However, the topography of Dubai is significantly different from that of the southern portion of the UAE in that much of Dubai's landscape is highlighted by sandy desert patterns, while gravel deserts dominate much of the southern region of the country. The sand consists mostly of crushed shell and coral and is fine, clean and white. East of the city, the salt-crusted coastal plains, known as sabkha, give way to a north-south running line of dunes. Farther east, the dunes grow larger and are tinged red with iron oxide.

The flat sandy desert gives way to the Western Hajar Mountains, which run alongside Dubai's border with Oman at Hatta. The Western Hajar chain has an arid, jagged and shattered landscape, whose mountains rise to about 1,300 metres (4,265 feet) in some places. Dubai has no natural river bodies or oases; however, Dubai does have a natural inlet, Dubai Creek, which has been dredged to make it deep enough for large vessels to pass through. Dubai also has multiple gorges and waterholes, which dot the base of the Western Al Hajar mountains. A vast sea of sand dunes covers much of southern Dubai and eventually leads into the desert known as The Empty Quarter. Seismically, Dubai is in a very stable zone—the nearest seismic fault line, the Zagros Fault, is 200 kilometres (124 miles) from the UAE and is unlikely to have any seismic impact on Dubai. Experts also predict that the possibility of a tsunami in the region is minimal because the Persian Gulf waters are not deep enough to trigger a tsunami.

The sandy desert surrounding the city supports wild grasses and occasional date palms. Desert hyacinths grow in the sabkha plains east of the city, while acacia and ghaf trees grow in the flat plains within the proximity of the Western Al Hajar mountains. Several indigenous trees such as the date palm and neem as well as imported trees such as the eucalypts grow in Dubai's natural parks. The houbara bustard, striped hyena, caracal, desert fox, falcon and Arabian oryx are common in Dubai's desert. Dubai is on the migration path between Europe, Asia and Africa, and more than 320 migratory bird species pass through the emirate in spring and autumn. The waters of Dubai are home to more than 300 species of fish, including the hammour. The typical marine life off the Dubai coast includes tropical fish, jellyfish, coral, dugong, dolphins, whales and sharks. Various types of turtles can also be found in the area including the hawksbill turtle and green turtle, which are listed as endangered species.

## The Palm Jumeirah

The result of five years of planning and land reclamation, The Palm, Jumeirah lies just off Dubai's coastline. It forms part of The Palm Islands, along with The Palm, Jebel Ali and The Palm, Deira, the world's three largest manmade islands.

The Palm, Jumeirah measures 5km<sup>2</sup>, has created 560ha of land and has added 78.6km to the country's 72km coastline.

At the peak of construction, 40,000 employees were working on the project each day, turning 94 million cubic metres of sand and seven million tons of rock into a leisure and lifestyle resort fit for the 21st century and beyond.

When completed in 2011, it will become home to 32 five-star beachfront hotels with 25,000 guests, 20,000 day visitors and about 60,000 residents in apartments and villas. Its population will have five beach resorts, four marinas, a monorail and thousands of metres of retail and commercial units at their disposal. The first phase of 4,000 villas was completed for occupation at the end of 2006 (sold out within 72 hours of release).

### A manmade island

It is a dream come true for Prime Minister and Ruler of Dubai HH Sheikh Mohammed bin Rashid Al Maktoum, who first revealed his vision of a manmade island in the 1990s. And it is property developer Nakheel Partners, currently undertaking \$30bn worth of projects in Dubai, that is turning that dream into a reality.

The Palm was conceived as a natural progression in a succession of extraordinary tourism initiatives in Dubai. It was also an answer to a practical challenge, which was how to create more beachfront when the emirate possessed only 72km of coastline.

The essence of the project is its design – its palm shape, which dictated every step of its development. The choice was both personal and professional. It symbolises Dubai's heritage (the palm is known as the 'bride of the orchard' in Dubai) as well as putting water, the most important source of sustenance, shelter and trade, centre stage.

Its shape also provides the perfect geometry to create the longest stretch of new beachfront. With these simple decisions made, the next step was to commission a vast

wealth of expertise from a host of disciplines in order to reclaim the land and turn it into a safe and habitable environment.

Hill International was the first outside consultant to be approached on the basis of its experience with ‘mega’ projects of a similar scale. Hill was already familiar with Dubai’s coastline, having worked on the redevelopment of Hamriyah Port, Deira Creek Waterfront, Deira Sea Corniche and Jumeirah Coastal Zone projects.

Also consulted on the overall concept design was US architectural firm Helman Hurley Charvat Peacock (HHCP), famous for its work with Sea World, Disney and Universal Studios.

Years of research, trials, surveys and environmental assessments were carried out to form the backbone of the project. These included a survey by Dubai-based Emirates Nortech to check the shape and volume of the island above and below the waterline.

Dubai-based Sogreath Gulf created a 3D physical scale model of the crescent to perform exhaustive tests in a laboratory tank using a 12m random wave generator, while WL Delft Hydraulics simulated tidal flow, using numeric modelling of the crescent breakwater.

This led to a crucial recommendation to include two 100m openings on either side to allow the sea to be refreshed every 14 days and improve the water quality. And so with all the figures crunched, models tested and designs adapted, the project moved to the first stages of construction.

In 2002, Nakheel awarded two contracts to Van Oord of the Netherlands and the Genevaregistered Archirodon Construction (Overseas). One of the first tasks was to create the breakwater to protect the reclaimed land from the strong currents and shamal winds of the Arabian Gulf.

Despite being more expensive and difficult to source, it was created from rock instead of concrete slabs to encourage the creation of a natural reef. Before The Palm there was virtually no sign of life, with 95% of the grid survey points falling on bare sand or mud.

“The breakwater of the Palm, Jumeirah is now 11.5km long and goes 50m under water,” says Chris O’Donnell, CEO of Nakheel.



“That is 550ha of artificial reef which will have marine life. Since its completion, the diversity of life is amazing; a whole host of different fish species have returned to the area and a pod of dolphins has even paid regular visits.”

The next step was the land reclamation, which although extensively managed in countries such as the Netherlands, had never been attempted on this scale. The elliptical shape of The Palm also made accuracy difficult when placing the sand. “Because there were no fixed points of land to survey from, no place to ‘drive a stake in the ocean’, there had to be some other means of locating the positions to place the materials,” O’Donnell explains.

The engineers found their solution in DGPS (differential global positioning system), which allowed them to check the accuracy of the placement to within 1cm. The sand – all 94 million cubic metres of it – was taken from the sea, not the Dubai deserts (seven million tons of rock also went into producing the first ever ‘curved’ breakwater). “The sand from the sea is more environmentally sustainable, more stable in terms of seismic and geotechnical terms and has the fertile, organic content that allows marine life to grow,” says O’Donnell.

Once dredged it was then vital to ‘settle’ the sand before it was built on – a natural process which normally takes millions of years. To build on unsettled land can lead to slippage – the Tower of Pisa being a good example. So, to hasten the settling, the sand underwent a process called vibro-compaction, which should mean there is no settlement greater than 1in in the next 50 years.

With the land reclaimed, the next step was to prepare it for occupation, with the installation of desalination plants, state-of-the-art vacuum sewerage wastewater treatment, underground power lines and the construction of a transport network including a monorail.

The transport network was designed following three in-depth surveys by leading traffic consultant MVA. These resulted in an extensive road network, with a connection to the mainland by a gateway bridge, two bridges with five lanes in each direction and a six-lane underwater tunnel connecting the spine to the crescent (1.4km long, 40m wide, and 25m below sea level).

The Palm Monorail, created by Hitachi Ltd, offers a greener option, running from one end of the development to the other – a journey of about ten minutes. It will be the

easiest way to explore The Palm – which is divided into distinct sections, each with its own unique character.

On 20th October 2008 site testing began on the newly delivered monorail trains on Palm Jumeirah.

Two of the nine trains supplied by Hitachi Ltd were raised on to the 5.45km track and began making initial test journeys, closely monitored by the RTA and operators SMRTE. Tests on the trains will be carried out for the next six months before the monorail is opened to the public in April 2009.

The new system will carry passengers between Gateway Station at the trunk of Palm Jumeirah and the Atlantis' Aquaventure Station on the crescent with intermediate stations at Trump International Hotel & Tower and the luxury retail centre Palm Mall. The system will eventually connect to the Dubai Metro with direct links to Dubai Airport and other major transport hubs.

The Palm Monorail is fully automatic and driverless (although manned by an attendant) and has been developed by a consortium led by the Marubeni Corporation. The system will initially carry up to 2,400 passengers an hour in each direction in four separate trains, each made up of three cars. When eventually at full capacity, the system will transport a maximum of 6,000 people in nine vehicles.

The vacuum sewerage system was completed in August 2008 to serve 2,000 villas using 900 collection chambers, 40km of pipeline and one of the world's largest vacuum chambers leading to a membrane bio-reactor (MBR) system on the trunk of The Palm. The system was developed by Corodex Electromechanic (a subsidiary of the Concorde-Corodex Group). The treated water is used for irrigation and thus saves the production of additional water from the project's desalination plant to satisfy the environment protecting Blue Communities Initiative.

First is the trunk, with the Village Centre at the north end – a 68,000m<sup>2</sup> commercial development. On the eastern shore 2,500 shoreline apartments were ready for occupation in 2006.

To the west is the Golden Mile, launched as a joint venture between Nakheel IFA Hotels & Resorts, the largest investor in The Palm, Jumeirah, and Istithmar. It comprises an exclusive residential and retail boulevard – one mile of more than 200

retail outlets, ten apartment buildings (700 apartments), a mall and offices and is expected to be opened in 2009.

At the centre of the island is the Trump International Hotel and Tower, the initial development in Nakheel and the Trump Organisation's joint venture in the Middle East, which includes exclusive rights for 19 countries in the Middle East and 17 major brands.

The new design for the \$600m landmark building, which combines a 300-room condo hotel with 360 freehold residential apartments, was unveiled in May this year. The ultra-modern design features a split-linked tower – an open-core design that minimises shadows constructed with stainless steel, glass and stone.

O'Donnell says: "With The Palm, Jumeirah development, Nakheel is creating an icon for the 21st century, and it is entirely fitting that the Trump Organisation is a key player and investor in realising this vision."

Indeed, Donald Trump himself has heralded The Palm, Jumeirah as the 'best location in Dubai', adding: "When I look at potential sites for real estate investment, I concentrate on 'location, location, location' – and this is the best location not only in Dubai but the whole of the Middle East."

Meanwhile, away from the frenetic pace of the trunk are the 16 fronds – with 1,500 luxury villas, which were occupied by the end of 2006. The shoreline apartments consist of 2,600 one to three-bedroom units and 80 penthouses and these were also occupied in 2006.

The 11.5km crescent tops the creation with 22 luxury hotels, including the \$1.5bn Atlantis Hotel, The Palm – a 1,500-roomed water-themed resort which opened in September 2008 under the direction of international developer and resort operator Kerzner International. In addition the Kempinski Emerald Palace hotel is due to open its doors on a 100,000m<sup>2</sup> plot in 2009 (the 200 Kempinski Palm Jumeriah Residences on the same plot will open in late 2008).

Four marinas – run under the umbrella of developer and manager of luxury marina facilities, Island GlobalYachting – complete the line-up. In November 2007 work began on the installation of two marinas in the anchor marina at the head of the trunk. The anchor marina will provide 582 berths and the first of these opened in mid-2008 including shops, restaurants, offices and cafes (the two marinas are connected by a

tunnel passing under the spine road). In total there will be 1,500 berths when The Palm is completed. The Marina residences close by will consist of 940 two-three bedroom apartments and penthouses and also 40 town houses.

The QE2 cruise liner will find a permanent home at one of the marinas on a special 300m pier by 2011, the facilities being completed for her by the end of 2008 (ship sets out on her final journey to Dubai in November 2008 from Southampton). The ex-cruise ship will become a luxury hotel and museum.

It is an exciting time for the 60,000 future residents of the island, the first few thousand of whom are due to take up residence by the end of 2006 – flocking from more than 70 nations round the globe. These are rumoured to include England footballers David Beckham and Michael Owen, as well as Bollywood star Shah Rukh Khan.

Following the residents will be a predicted 25,000 guests at the 32 five-star hotels, attracted by names such as Mövenpick, Fairmont, Radisson SAS, Hilton, Metropolitan, Shangri La and One&Only, in addition to Trump and Atlantis. With 15 million visitors predicted to flock to the emirate by 2010, it may be wise to book in advance to secure a room.

As Sultan Ahmed Bin Sulayem, executive chairman of Nakheel, says: “After all the talk, excitement, challenges and anticipation, the eighth wonder of the world is turning from a dream into a reality.”

Dubai Creek runs northeast-southwest through the city. The eastern section of the city forms the locality of Deira and is flanked by the emirate of Sharjah in the east and the town of Al Aweer in the south. The Dubai International Airport is located south of Deira, while the Palm Deira is located north of Deira in the Persian Gulf. Much of Dubai's real-estate boom is concentrated to the west of Dubai Creek, on the Jumeirah coastal belt. Port Rashid, Jebel Ali, Burj Al Arab, the Palm Jumeirah and theme-based free-zone clusters such as Business Bay are all located in this section. Dubai is notable

for sculpted artificial island complexes including the Palm Islands and The World archipelago.

Dubai has a rich collection of buildings and structures of various architectural styles. Many modern interpretations of Islamic architecture can be found here, due to a boom in construction and architectural innovation in the Arab World in general, and in Dubai in particular, supported not only by top Arab or international architectural and engineering design firms such as Al Hashemi and Aedas, but also by top firms of New York and Chicago. The most recent addition to the magnificent skyline of Dubai is the 150 meter high Dubai Frame located in Zabeel Park, Dubai. It has been described by The Guardian as "the biggest picture frame on the planet", however is also controversial as the "biggest stolen building of all time". It is alleged that the designer Fernando Donis had his intellectual property stolen and was denied credit for the design. As a result of this boom, modern Islamic – and world – architecture has literally been taken to new levels in skyscraper building design and technology. Dubai now has more completed or topped-out skyscrapers higher than 2/3 km (2,200 ft), 1/3 km (1,100 ft), or 1/4 km (820 ft) than any other city. A culmination point was reached in 2010 with the completion of the Burj Khalifa (Khalifa Tower), now by far the world's tallest building at 829.8 m (2,722 ft). The Burj Khalifa's design is derived from the patterning systems embodied in Islamic architecture, with the triple-lobed footprint of the building based on an abstracted version of the desert flower *hymenocallis* which is native to the Dubai region. The completion of the Khalifa Tower, following the construction boom that began in the 1980s, accelerated in the 1990s, and took on a rapid pace of construction unparalleled in modern human history during the decade of the 2000s, leaves Dubai with the world's tallest skyline as of 4 January 2010. At the Top, Burj Khalifa, the world's highest observatory deck with an outdoor terrace is one of Dubai's most popular tourist attractions, with over 1.87 million visitors in 2013.

Dubai Gold Souk , is a traditional market in Dubai, UAE. The souk is located in Dubai's commercial business district in Deira, in the locality of Al Dhagaya. The souk consists of over 380 retailers, most of whom are jewellerytraders. The major items of mall includes Gold, Platinum, Diamonds and some times also deals in silver.

Dubai Gold Souk is bordered to the north by the Dubai Fish and Vegetable Market and the Deira Corniche near Baniyas Square at Sikkat al-Khali Street which is in close proximity to the Deira Bus Stand.

Dubai Pearl is a 73 storey, 300 m (984 ft), tall residential skyscraper under construction along Al Sufouh Road in Dubai, United Arab Emirates. It will consist of four mixed-use towers connected together at the base and by a sky bridge at the top.

The construction has been on hold since 2006, with the project labeled "sad," "troubled," and "fallen."

The structural design was carried out by Dubai-based engineering firm e-Construct. Construction was started in 2009, and the project will cost \$4 billion (Dh14.6 billion). Once completed, Dubai Pearl will accommodate 9,000 residents and its commercial sector will employ 12,000 people.

Dubai Festival City is a large residential, business and entertainment development in the city of Dubai, United Arab Emirates, owned by Al-Futtaim Group. Touted as a "city-within-a-city", Dubai Festival City is the Middle East's largest mixed-use development: all elements for work, living, and leisure will be contained within the project. Once completed Festival City will comprise a series of residential communities, numerous hotels, malls, a golf course and other entertainment sites, and a full suite of public services, including schools.

Dubai Industrial Park, formerly known as Dubai Industrial City is the dedicated industrial park in Dubai, founded in 2004, covering an area of 560 million Sq ft. When completed the development will include food and beverage zones, base-metal and transportation zones, warehouses and an extensive conservation area. These areas are further complemented with logistics, educational and mixed use developments. It will be located near Jebel Ali International Airport along Emirates Road. The city is expected to accommodate around 500,000 people when it is completed by 2015.

Dubai International city is a country-themed architecture of residences, business, and tourist attractions. Spreading over an area of 800 hectares (8 million square meters), the arrangement of the city is inspired by the traditional carpets of Middle East. Once completed, the project will contain studio and one bedroom apartments and accommodate over 60,000 residents.

Dubai International City is located in the Al Warsan region of Dubai, opposite to the Dubai Central Fruit and Vegetable Market.

It is composed of 485 buildings embraces the residential districts of Central Business District (CBD), Persia, Greece, Spain, Morocco, England, France, Italy, Russia, China

and Emirates. Apart from these districts that were initially planned for Dubai International City namely Lake District and Forbidden City are now on put on hold due to the effects of the Global Financial Recession. Attractions in the city includes the Dragon Mart, which is the worlds biggest machinery and equipment market.

## Projects

The Residential District of Dubai international city is expected to have numerous country specific and themed residential developments and retail outlets.

The plans include ten country-specific districts:

- China District at one end of the residential district.
- England Precinct, mirroring traditional London architecture.
- France District featuring two-, three- and four-storey residential blocks characterized by long French windows, red and gray bricks, and pilasters or half-columns.
- Persia District, situated in the heart of the residential district.
- Greece District, at the edge of the residential district.
- Russia District
- Spain District. Its three-and four-storey buildings are designed according to traditional stucco exterior finish.
- Morocco District. The precinct's three- and four-storey residential buildings are decorated with green tiles, natural terra-cottas, stucco walls and wide-arched windows.
- Italy District. Two- to four-storey residential blocks.
- Emirates District. The 10th precinct in the Residential District lies at the northeast end.

It's the most luxurious and stylish residents in Dubai International city. With Building security, pools, private parking, gyms and park it is a family paradise. Lots of shops and restaurants are based in this area.

The Forbidden city will encompass an area of 240,000 square metres with parking facilities for 2,000 cars, the city is the replica of Forbidden City of Beijing, China.

#### The Lake District

The Lake District surrounds the Al Warsan Lake. The lake is off limits to public.

#### Dragon Mart

DragonMart, developed by Chinamex, is a large mall for wholesale purchase of Chinese products. The large size of this mall makes it a gateway for customers making purchase runs throughout the Middle Eastern and North African Markets, and is a platform for Chinese traders and manufacturers seeking regional market entry.

The mall has been a commercial success and construction has started on a second mall adjacent to Dragon Mart that will have 175,000 square metres of space and 4,500 parking spaces. The project was completed in December 2015.

#### Warsan Village

Launched in 2013, Warsan Village is located at the periphery of International City. This enclave within International City will feature 942 townhouses and 250 apartments. Construction is now underway.

#### Medical Facilities

The hospitals are closely located, with Rashid Hospital around 15 minutes driving distance from the Location. However, there are Polyclinics such as Apple Clinic, located in France Cluster and Apple International Polyclinic, located in Greece Cluster offering Primary care facilities.

For Driving License related (Road & Transport Authority Dubai) eye testing and medical tests for Commercial Taxi Drivers or New Drivers can be completed from Apple International Polyclinic



Recent regulations implemented by the Municipality of Dubai, will greatly address the prevalence of Shisha parlors housed in many buildings.

Dubai International Academic City (DIAC), was built near Al Ruwayyah along the Dubai-Al Ain Road in the city of Dubai, United Arab Emirates. DIAC is located within Dubai Academic City, which spreads over an area of 129,000,000 square feet (12,000,000 m<sup>2</sup>). The project was launched in May 2006 as an area where educational institutions from within Dubai Knowledge Village will move to. The purpose of DIAC is to be a base for schools, colleges and universities. More than 12,000 students study in 13 international higher education institutes in DIAC.

Culture Village is a multi-purpose development project in the United Arab Emirates, located along the shoreline of the Dubai creek on a 40,000,000-square-foot (3,700,000 m<sup>2</sup>) plot of land. When completed the village will include a harbor, cultural and exhibition centres, and dockside development. The centrepiece of this project is Palazzo Versace Dubai, the world's second after Palazzo Versace of Queensland, Australia.

Global Village Dubai is located on Sheikh Mohammed Bin Zayed Road (E311) Dubai. Global Village Dubai combine the world 90 countries cultures at one place. Global Village Dubai, claims to be the world's largest tourism, leisure, shopping and entertainment project. It is the region's first cultural, entertainment, family and shopping destination. Every year, it has over 5 million visitors over an area of 17,200,000 sq ft (1,600,000 m<sup>2</sup>).

Al Maktoum International Airport (IATA: DWC, ICAO: OMDW) is an international airport in Jebel Ali, 37 kilometres (23 mi) southwest of Dubai, United Arab Emirates that opened on 27 June 2010. It is the main part of Dubai World Central, a planned residential, commercial and logistics complex.

The airport will contain transport modes, logistics and value-added services, including manufacturing and assembly, in a single free economic zone. It will cover an area of 14,000 hectares (35,000 acres). The airport has a projected annual capacity of 12 million tonnes (12,000,000 long tons; 13,000,000 short tons) of freight and between 160 million and 260 million passengers. As of December 2014, only a handful of airlines operate passenger services out of Al Maktoum International Airport.

Construction

The 4,500 m × 60 m (14,760 ft × 200 ft) runway was completed in 600 days and subsequently underwent tests over the following six to eight months in order to fulfil its CAT III-C requirements. Construction of the airport's cargo terminal, the Al Maktoum Airport Cargo Gateway, which cost around US\$75 million, was 50% complete by the end of 2008.

During the first phase of the project, the airport is planned to handle around 200,000 t (200,000 long tons; 220,000 short tons) of cargo per year, with the possibility of increasing to 800,000 t (790,000 long tons; 880,000 short tons). The passenger terminal at this phase is designed to have a capacity of 5 million passengers per year. It was planned to be the largest airport in the world in terms of freight handled, moving up to 12 million tonnes (12,000,000 long tons; 13,000,000 short tons) per year in 2013.

The project was originally expected to be fully operational by 2017, although the 2007–2012 global financial crisis subsequently postponed the completion of the complex to 2027. Previous working names for the airport complex have included "Jebel Ali International Airport", "Jebel Ali Airport City", and "Dubai World Central International Airport". It has been named after the late Sheikh Maktoum bin Rashid Al Maktoum, the former Ruler of Dubai. The total cost of the airport has been estimated by the Dubai government to be \$82 billion.

## Operations

Al Maktoum International Airport opened on 27 June 2010 with one runway and only cargo flights. The first flight into the airport occurred on 20 June 2010, when an Emirates SkyCargo Boeing 777F landed after a flight from Hong Kong. The flight served as a test for various functions such as air traffic control, movement of aircraft on the ground, and security. According to Emirates, the flight was an "unmitigated success".

On 24 February 2011, the airport was certified to handle passenger aircraft with up to 60 passengers. The first passenger aircraft touched down on 28 February 2011, an Airbus A319CJ. The airport officially opened for passenger flights on 26 October 2013 with Nas Air and Wizz Air as the two carriers to operate from the airport.

In the first quarter of 2014, 102,000 passengers went through the airport. At the time of its opening, three cargo service airlines served Al Maktoum International Airport,

including RUS Aviation, Skyline Air and Aerospace Consortium. Fifteen additional airlines have signed a contract to operate flights to the airport.

Passenger numbers in the first half of 2016 totalled 410,278, up from 209,989 in the first half of 2015.

### Facilities

The airport will be the largest component of Dubai World Central, with a surface area of more than 280 square kilometres (110 sq mi). If completed as planned, the airport will have an annual cargo capacity of 12 million tonnes (12,000,000 long tons; 13,000,000 short tons), and a passenger capacity of up to 260 million people per year. In the future it will handle 851 million passengers This would make it the largest airport in the world in both physical size and passenger volume.

Al Maktoum International Airport intends to handle all types of aircraft. Up to four aircraft will be able to land simultaneously.

The airport will include:

- Three passenger terminals, including two luxury facilities; one dedicated to Emirates, the second to other carriers, and the third dedicated to low-cost carriers
- Multiple concourses
- Executive and royal jet centres
- Hotels and shopping malls
- Support and maintenance facilities: the region's only hub for A-, B-, and C-checks on all aircraft up to A380 specifications

Al Maktoum International Airport will be linked to the existing Dubai International Airport by a proposed high-speed express rail system, and served by the Dubai Metro and a dedicated Dubai World Central light railway.

The airport was initially planned to have six runways, but this number was reduced to five 4,500 m (14,800 ft) parallel runways in April 2009, with a large passenger complex in the middle. Furthermore, each runway would have extended asphalted pathways on either side which would allow aircraft to by-pass other runways and taxiways without disturbing aircraft movements of these runways and taxiways. Dubai

expects an exponential rise in passenger traffic over its skies, with the presumption that it will become the primary air hub for transiting travelers from the Asia–Pacific Region, South Asia, Greater Middle East, Africa, Europe, and Australia (for the Kangaroo route: Australia to Britain and back).

Several large warehouses and hangars line the westernmost part of the airport. These interlinked hangars will stretch from end-to-end of the westernmost runway. Each of these is capable of housing A380 aircraft.

The airport will complement Dubai International Airport, some 40 km (25 mi) away. It is surrounded by a logistics hub, a luxurious golf resort, a trade and exhibition facility with 3 million square metres of exhibition space, a commercial district, and a residential and hotel area.

The Dubai World Central will have a total of 100,000 parking slots for automobile vehicles for its employees, Dubai residents, tourists, and other users

Dubai South is the development currently under construction in Dubai, United Arab Emirates. Identified as the emirate's flagship urban project, Dubai South is centered on the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. Dubai South – the re-branded Dubai World Central – is a 145 sq km city that includes the World Expo 2020 site as well as Dubai's second airport – Al Maktoum International, which is slated to become the largest airport in the world when complete. Launched in 2006, Dubai South features a mix of residential and commercial property and is slated to have a population of one million when ready.

It will be an economic zone to support a number of activities including logistics, aviation, commercial, exhibition, humanitarian, residential and other related businesses around Al Maktoum International Airport with the planned annual capacity of 12 million tonnes of cargo and 160 million passengers. The construction area is 140 square kilometres, almost two times the size of Hong Kong Island. The location is estimated to be the future home of 900,000 people. The Dubai World Central combined with the Al Maktoum International Airport is expected to draw additional tourism to the Middle East, designed to handle 20 million visitors a year by 2020. The development has been designed on the basis of three key factors: Dubai's geographic location, increasing importance of airports in the Middle East region, and the region's booming aviation sector. The Dubai International Central functions as the central hub

for the MENASA market, serving nearly one quarter of the world's population and doing 3.6 trillion USD in business in the year 2009.

Dubai World Central–Al Maktoum International was first announced back in 2004 as part of an extremely ambitious plan to develop the world's biggest airport. Once complete, the project, which is being rolled out over several phases over the coming decades, will have five runways, four terminal buildings and capacity for 160m passengers and 12m tonnes of cargo annually.

The Dubai Autodrome is an FIA sanctioned 5.39 km (3.349 mi) motorsports circuit located in Dubailand, Dubai, United Arab Emirates. The architects of the project were Populous and the circuit was designed by Clive Bowen of Apex Circuit Design.

Opened in October 2004 with the final round of the LG Super Racing Weekend featuring the final rounds of the FIA GT Championship, European Touring Car Championship and 2004 Formula Renault V6 Eurocup season, Dubai Autodrome was the first part of the Dubai Motor City development that was available for use. The venue hosted the December 2005 A1 Grand Prix and the FIA GT Championship from 2004 to 2006. The track record at the longest configuration was set by Kamui Kobayashi (DAMS) with a time of 1:41.220 in a GP2 Asia car.

Since 2006 the Autodrome has been home to the Dubai 24 Hour, a GT, sports car and touring car automobile endurance race open to both professional and semi-professional teams. The circuit has FIA Grade 1 license.

The circuit - which has four racing configurations and two additional non-racing sections - was designed to meet the strictest safety requirements and is the first FIA-sanctioned circuit to incorporate wide asphalt run-off areas. The digital surveillance system provides complete coverage of all areas of the track and is linked to the Race/Safety control room for monitoring and saving on hard disk recorders. This means that every incident along the track during a race or event can be viewed by the clerk of the course. Most facilities are housed in a two-storey ultra modern complex facing the grandstand.

These facilities include Pit Complex, Race/Safety Control Room, Timekeeping Room, Media Centre, VIP Suite and Stewards Room. A Medical Centre is situated behind the Pit area for track emergencies during major events. At the rear of the Pits is a traditional racing paddock for team staff and hospitality.

Dubai Sports City or DSC a multi-venue sports complex in Dubai, United Arab Emirates, developed by Dubai. It provides a mix of residential, retail, leisure and recreational facilities. It is built around five major sports venues and features a number of sports academies. Located on Mohammad Bin Zayed Road the residential aspect of the project consists of mid-rise apartment buildings, townhouses and villas. Sports City contains three distinct residential districts: Canal Residence, Victory Heights and Gallery Villas.

### The Dubai Metro

Planning of the Dubai Metro began under the directive of Dubai's Ruler, Sheikh Mohammed bin Rashid Al Maktoum, who expected other projects to attract 15 million visitors to Dubai by 2010. The combination of a rapidly growing population (expected to reach 3 million by 2017) and severe traffic congestion necessitated the building of an urban rail system to provide additional public transportation capacity, relieve motor traffic, and provide infrastructure for additional development.

In May 2005, a AED 12.45 billion/US\$3.4 billion design and build contract was awarded to the Dubai Rail Link (DURL) consortium made up of Japanese companies including Mitsubishi Heavy Industries, Mitsubishi Corporation, Obayashi Corporation, Kajima Corporation and Turkish firm Yapı Merkezi, and the Project Management ('The Engineer') and Construction Management services contract awarded to a French-American joint venture between Systra and Parsons Corporation. The first phase (worth AED 15.5 billion/US\$4.2 billion) covers 35 kilometres (22 mi) of the proposed network, including the Red Line between Al Rashidiya and the Jebel Ali Free Zone set for completion by September 2009 and the Green Line from Al Qusais 2 to Al Jaddaf 1. This was to be completed by June 2010. A second phase contract was subsequently signed in July 2006 and includes extensions to the initial routes. The Red Line partially opened at 9 minutes and 9 seconds past 9 pm on 9 September 2009 (9/9/9 9:9:9), inaugurated by Sheikh Mohammed bin Rashid al Maktoum.

Work officially commenced on the construction of the metro on 21 March 2006. In February 2009, a top RTA Rail Agency official said the US\$4.2 billion Dubai Metro project would be completed on schedule despite the global crisis. However, only 10 out of 29 metro stations of the red line opened on 9 September 2009.

Construction of the 18 stations on the red line and another 18 on the green line restarted on 7 February 2010, according to contractors, after a settlement was reached with a Japanese-led consortium over disputed payments of about US\$2 billion-US\$3 billion. Construction of all 29 metro stations on the Red Line was declared complete on 28 April 2010 by the acting chief of the RTA Rail Agency.

Seven more stations on the Dubai Metro Red Line opened on 30 April 2010. Ten new trains were pressed into service, giving a total of 22 trains in service when the stations opened. The seven stations are, Emirates Station, Airport Terminal 1 Station, Dubai Internet City (TECOM) Station, Al Karama Station (now ADCB), Emirates Towers Station, Dubai Marina Station (now Damac Properties) and Ibn Battuta Station. In addition to this, a further three stations were opened on 15 May 2010; GGICO Station and World Trade Center Station. Furthermore, Business Bay Station, First Gulf Bank Station (Now First Abu Dhabi Bank), Sharaf DG (Al Barsha) Station, Nakheel (Emirates Golf Club) Station and Jumeirah Lakes Towers Station were opened on 15 October 2010. After much delay, Jebel Ali Station, the terminus of the Red Line on the Abu Dhabi side was opened on 11 March 2011, and Jebel Ali Industrial Station, renamed Danube Station, was opened on 12 December 2012. The final two stations, Al Jadaf and Creek, on the Green Line were opened on 1 March 2014.

The Dubai Metro is operated by Serco under contract to the Dubai Roads and Transport Authority.

Red Line trains run every 7 minutes off-peak (averaging 8.5 trains per hour), with a minimum headway of 3 minutes 45 seconds (16 trains per hour) during peak hours, with 44 trainsets in service. From 2010, when 51 trains were in service, the line had a peak-hour capacity of 11,675 passengers per hour in each direction. As of September 2014, the Red Line operates 60 trains (train registrations 5001-5045, 5065-5079) The theoretical maximum design capacity is 25,720 passengers per hour, which would require 106 trains.

The Green Line had an initial capacity of 6,395 passengers per hour per direction, with 19 trains (train registrations 5046-5064) in service as of September 2014. The design capacity of this route is put at 13,380 passengers per hour with 60 trains in service.

Proposed

In 2011, the RTA stated that there are no "immediate plans" to build the Blue and Purple lines "in the next five or six years".

In 2013, the RTA laid out a three phase plan to expand the existing lines and build new ones: extending the Green Line by 12 stations and 24 kilometres (15 mi) to Academic City by 2020; expanding the overall system by 58 stations and 91 kilometres (57 mi) by 2025 and completing expansion with a total of 69 stations and 221 km over and above the present 47 stations and 70 kilometres (43 mi) that are present as of January 2013.

- Purple Line: along Al Khail Road. There will be about eight stations, three with check in facilities. However, The Dubai Airports claimed that this was unfeasible as it did not pass through many localities. They however suggested opting for a "central terminal" similar to those in Europe where trains leave from inside the airport to the other airport with trains also leaving to the city. The RTA have taken this into consideration.
- Blue Line: along Mohammed Bin Zayed Road.
- Pink Line. The Pink Line is planned to run east-west with a terminus at Al Sufouh and is scheduled for completion by 2030.
- Gold Line: Announced as the 'Yellow Line' in April 2008 and confirmed in January 2013 as the 'Gold Line'. One of the stations planned for the Gold Line is the Dubai Land Station, west of Meydaan. The Gold Line will connect Arabian Ranches, Deira, and Dubai Marina and is scheduled to open by 2025.
- Red Line Extension: 15.5 kilometres (9.6 mi) and six new stations, terminating at the border with Abu Dhabi. No dates for completion announced.
- Green Line Extension: The line could be further extended by 11 km from Al Jaddaf to International City under the Green Line extension project.

In 2014, the RTA approved the recent proposal of extending the red line from Al Rashidiya station to Mirdif City Center which will increase 3.5 kilometer with the new station. However, there is also a proposal to extend it further to Al Warqa'a which is currently being studied.



On the green line, the RTA has finalized the extension plan of 20.6 kilometer from Al Jaddaf to Academic City. The extension will go through Festival City, Lagoons, Ras Al Khor Industrial Area, International City, Silicon Oasis and Dubai Academic City.

Japanese manufacturer Kinki Sharyo built a total of 79 five-car trains (60 on Red Line, 19 on Green Line). They are designed to carry 643 seated and standing passengers, and unusually for a mass transit system, the trains have three classes of accommodation: Gold Class (first class), Women and Children class (a classification that is extended to a greater number of cars during the peak hours), and regular Silver Class (economy). The first train (5001) was delivered to Dubai in March 2008. The metro has driver less operation and uses third rail current collection. Trained wardens accompany passengers to help with emergencies. The four newer trains are each painted with a different special livery, in which one of them representing the skyline of Dubai.

50 new trains, manufactured by Alstom, will be introduced to the system starting from November 2018. The trains have higher seat capacity, 696 seats, up from 643 seats on the current trains. This will increase passenger capacity by about 10%. The new trains have a refreshed interior with better air conditioning, digital maps, improved speed, brakes and doors. Out of these 50 trains, 35 will run on the red and green lines while the remaining 15 will run on Route 2020, scheduled to open by the end of 2019.

### Business Bay

is a central business district under construction in Dubai, United Arab Emirates. The project features numerous skyscrapers located in an area where Dubai Creek has been dredged and extended. Business Bay will have upwards of 240 buildings, comprising commercial and residential developments. The infrastructure of Business Bay has been completed in 2008, and the entire development is expected to be completed between 2012-2015. Business Bay is part of the vision of His Highness Sheikh Mohammed Bin Rashed Al Maktoum, UAE Vice President, Prime Minister, Minister of Defence, and Ruler of Dubai. Business Bay will be a new 'city' within the city of Dubai and is being built as a commercial, residential and business cluster along a new extension of Dubai Creek extending from Ras Al Khor to Sheikh Zayed Road. Covering an area of 64,000,000 square feet (5,900,000 m<sup>2</sup>), once completed it will be composed of office and residential towers set in landscaped gardens with a network of roads, pathways and canals. It will become the region's business capital as well as a freehold city.

The entire development covers an area of 46,900,000 sq ft (4,360,000 m<sup>2</sup>), and the gross leasable area is 78,500,000 sq ft (7,290,000 m<sup>2</sup>). The projected population of the entire development is more than 191,000, and the estimated population of employers and others is 110,000, making the total population more than 300,000. Commercial development will comprise 2,653,244 sq ft (246,494.4 m<sup>2</sup>), which is 18.5 percent of the entire development; mixed use development will comprise 8,520,368 sq ft (59.4 percent); and residential development will cover 3,163,628 sq ft (22.1 percent). Business Bay will cost AED 110 billion (USD 30 billion).

Bay Square is a mixed-use community within Business Bay. The entire development will be a pedestrian-only zone, and will include walkways over canals. It will cover over 2,400,000 square feet (220,000 m<sup>2</sup>) and will be located 1 km away from Sheikh Zayed Road within Business Bay. When completed it will comprise canals, sidewalks, restaurants, cafes and retail stores. It will have 1,600,000 sq ft (150,000 m<sup>2</sup>) of office space; Bay Square will host numerous small and medium-sized enterprises. When Bay Square completes there will be approximately 575 offices with an average size of 2,000 sq ft (190 m<sup>2</sup>). Bay Square is expected to be completed in 2010. It will comprise the following buildings:

- Bay Square Commercial Building
- Bay Square Hotel
- Bay Square Office Building (10 Office Buildings in total)
- Bay Square Residential Building

Business bay is connected to Red Line of Dubai Metro with Business Bay Station, which opened on 25 April 2010, together with most of the remaining stations of Dubai Metro's Red Line.

The Jumeirah Lakes Towers is a large development in Dubai, United Arab Emirates which consists of 80 towers being constructed along the edges of three artificial lakes (Lake Almas West, Lake Almas East, JLT Lake) as well as the JLT Embankment of 8 tower facing Jumeirah Islands. Initially JLT had 4 lakes (Lake Almas West, Lake Almas East, Lake Elucio, Lake Allure), in late 2012 developer (DMCC) announced

that lake Elucio would be drained and 55,000 meter park would be created instead. Subsequently, Lake Allure has been renamed to JLT Lake. The total area covered by the lakes, waterways and landscaping will be 730,000-square-metre (7,900,000 sq ft). The towers will range from having 35 floors to having 45, except for the centerpiece ( Almas Tower ), which is 66 floors. The tallest tower and the centerpiece of the entire complex is Almas Tower which is situated on its own island between Lake Almas West and Lake Almas East.

The completion of Saba Tower in December 2006 marked the first tower to be completed in Jumeirah Lakes Towers. The majority of construction took place in 2008. By April 2011, over 80 percent of the towers in JLT was claimed to have been completed. As of June 2015 there were reported to still be 11 towers being either left undone due to the 2009 crisis or still undergoing construction in JLT. The most prominent of these are Wind Tower 1 and Wind Tower 2 that are part of Cluster B and right on Shk. Zayed Road - they are under construction since more than 12 years.

#### Hotels and Hotel Apartment

In the beginning, there were three operating hotels at Jumeirah Lakes Towers, the first being the Bonnington Jumeirah Lakes Towers, the second being the Armada Bluebay Hotel that opened its doors on September 2014 and the third hotel is Movenpick Jumeirah Lakes Towers. The recent addition is Pullman Jumeirah Lakes Towers decided to establish their doors to the JLT community, bringing the number of hotels in Jumeirah Lakes Towers to four.

#### Healthcare Facilities

The Armada Medical Center which is part of Armada Group's located in Cluster P Armada Towers is the first and major healthcare facility opened in Jumeirah Lakes Towers followed by Life Medical Center ( Cluster V, JBC 2 ), Aster Medical Centre ( Red Diamond Building ), Dr."K" Medical Centre ( Cluster F, Indigo Icon Tower ) and Optimum Diagnostic Clinic

#### Almas and the Jewellery Business

The centerpiece is Al Mas building (Arabic for "the Diamond") comprises floors and houses the Dubai Multi Commodities Centre (DMCC) head office as well as Dubai Diamond Exchange. The basement of the tower houses the main diamond vault.

## University

There are currently two Universities in Jumeirah Lake Towers. One is called Saint Petersburg State University of Economics and Finance located in Cluster P Armada Towers and the second University is Synergy University Dubai Campus located in Cluster I, Platinum Tower which offers Bachelor, Masters and MBA programs.

## Population and Facilities

The project is estimated to have a resident population of around 60,000 and a working population of another 120,000; it will include 5 children playgrounds, 3 mosques, a 55,000 meter park (Reshaped from Lake Elucio in 2013-2014), a police station, a civil defense station, a hospital and other facilities.

There are two available Dubai metro stations along the site: Dubai Marina and Jumeirah Lakes Towers stations.

## Dubai Marina

### Development

In order to create the man-made marina, the developers brought the waters of the Persian Gulf into the site of Dubai marina, creating a new waterfront. There is a large central waterway, excavated from the desert and running the length of the 3 km site. More than 12% of the total land area on the site has been given over to this central public space. Although much of this area is occupied by the marina water surface, it also includes almost 8 km of landscaped public walkways.

The marina is entirely man-made and has been developed by the real estate development firm Emaar Properties of the United Arab Emirates and designed by HOK Canada. Upon completion, it is claimed to be the world's largest man-made marina. The current largest man-made marina in the world is Marina del Rey in California, United States. There is a publicly accessible foreshoreway around the marina and some sections of public oceanway along the beach with views to Palm Jumeirah. Its largest development is the Jumeirah Beach Residence. Dubai Marina opened doors to its only mosque Masjid Al Rahim in October 2013, which is situated in the southern end of the Marina.

### Phase I

The first phase of Dubai Marina covers 25 acres (100,000 m<sup>2</sup>), which includes six freehold apartment buildings, the Dubai Marina Towers. The phase I of Dubai Marina cost more than AED 1.2 billion. Three of the towers are named after precious stones, Al Mass, Fairouz, and Murjan, and the other three are named after Arabic scents, Mesk, Anbar, and Al Yass. The scheme was designed by HOK and the contractors were Al-Futtaim Carillion and Nasah Multiplex.

### Phase II

The Phase II of Dubai Marina will consist of high rise buildings, which are mainly clustered into a block, known as "Tallest Block in the world" with the majority of the skyscrapers ranges between 250 metres (820 ft) to 300 metres (984 ft), which includes Cayan Tower, Ocean Heights, Marina Pinnacle, Sulafa Tower and few are taller than 350 metres (1,148 ft) meters and 400 metres (1,312 ft), which includes Elite Residence, 23 Marina, Princess Tower, Marina 101, DAMAC Residence, and the supertall Pentominium, which rises to 516 metres (1,693 ft) meters.

### Jumeirah Beach Residence

Jumeirah Beach Residence is a 1.7 kilometres (1.1 mi) long, 2 square kilometres (0.77 sq mi) gross floor area waterfront community located against the Persian Gulf in Dubai Marina. It is the largest single phase residential development in the world and contains 40 towers (35 are residential and 5 are hotels). JBR can accommodate about 15,000 people, living in its apartments and hotel rooms. The Project has 6,917 apartments, from 900 sq ft (84 m<sup>2</sup>) studios to 5,500 sq ft (510 m<sup>2</sup>) penthouses. Jumeirah Beach Residence was launched in August 2002 from the developer, Dubai Properties (a subsidiary of Dubai Holding) with the cost of 6 billion dirham and was completed in 2007. The Walk at JBR restaurant and shopping strip, which is adjacent to the beach behind JBR, is a very popular location for Al Fresco dining. There are five hotels, rated as 5 star or 4 star, three of which are purpose-built hotels, while the other two are converted residential towers.

### The Walk

The Walk at Jumeirah Beach Residence is a 1.7-kilometre strip at the ground and plaza level of the complex, it was developed by Dubai Properties, and was completed by 2007 and opened officially in August 2008.

### The Beach

The Beach at Jumeirah Beach Residence is a retail complex being constructed on the beach in front of JBR by Meraas Holding, a company owned by Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai. The development, comprising four plazas, will occupy the bulk of the beach between the Hilton and Sheraton hotels. The complex houses a number of levels of parking as well as seventy retail and food and beverage outlets, together with entertainment facilities.

### Al Sahab

Al Sahab is a waterfront twin tower which directly overlooks the largest bay of water at Dubai Marina. From the level three Marina homes upwards, all residents have views over Dubai Marina. Its developed by Emaar and considered to be Dubai Marinas most premium tower. It benefits from the highest price per sq ft in Dubai.

### Al Majara

Al Majara is a five-building residential complex comprising high-rise waterfront apartments adjacent to where the old Dubai Marina Yacht Club used to be and overlooks the largest part of the bay.

### Marina Promenade

Marina Promenade is a residential enclave in Dubai Marina. Nestled within the panoramic confines of Dubai Marina, it overlooks the widest and most scenic part of the bay and is ideally located opposite the Dubai Marina Yacht Club. The Marina Promenade comprises six residential towers and villas with views of the bay.

### Marina Quays

Marina Quays is 20 meters long, over the water on the waterfront. Along with apartments and villas, the development has shops and other outlets. Marina Quays is a three-building residential development; the buildings are Quay East, Quay West and Quay North.

### Park Island

Park Island is a four tower residential development comprising Blakely, Bonaire, Fairfield and Sanibel. The towers within Park Island have been placed with parks and landscaped gardens.

### Dubai Marina Mall

Dubai Marina Mall is a shopping mall located in the center of Dubai Marina, for residents and visitors of the Dubai Marina. It features 140 retail outlets, spread over 390,000 sq ft of gross leasable space, making it one of the largest shopping malls in Dubai. The mall has been completed and opened in December, 2008.

### Dubai Marina

Dubai Marina has been connected through the Dubai Metro's red line to the other places of Dubai. Dubai Marina is a rapid transit station on the Red Line of the Dubai Metro in Dubai. It opened on 30 April 2010 as part of an extension to Ibn Battuta. Dubai Marina station is located near Interchange 5 of Sheikh Zayed Road, around 20 kilometres (12 mi) southwest of Downtown Dubai. It lies to the east of the northern half of the Dubai Marina and to the west of the northern portion of Jumeirah Lake Towers. Dubai Marina station lies on a viaduct paralleling the eastern side of Sheikh Zayed Road. It is categorised as a type 2 elevated station, indicating that there is an elevated concourse between street and platform level. Pedestrian access to the station is aided through walkways above Sheikh Zayed Road, connecting to developments on either side of the road. In September 2014, Damac Properties acquired the naming rights for the Dubai Marina Station, which resulted in it being renamed as the Damac Station.

### Dubai Tramway

Al Sufouh Tramway is a tramway being built in Al Sufouh, Dubai Marina. It will run 14.5 kilometres (9.0 mi) along Al Sufouh Road from Dubai Marina to the Burj Al Arab and the Mall of the Emirates. It is expected to interchange with three stations of Dubai Metro's Red Line. The Sufouh Tram will also connect with the monorail of the Palm Jumeirah at the entrance of the Palm from Sufouh Road. Upon completion in 2014 it will serve the residences of Dubai Marina. As of mid-2012, the project was expected to be completed by November 2014.

### Controversy

Like many other infrastructure projects in the Persian Gulf, the Dubai Marina has seen strikes by labourers (who are generally from developing countries, as the region's locals are mostly not willing to do menial work). They have protested the poor wages and the substandard conditions they are often forced to work or live in. In all cases, police were quick to ensure that the protests did not get out of hand.

In August 2015, various people (including police officers) were arrested, after they were caught with prostitutes and illegal alcohol, on a boat in Dubai Marina.

Downtown Dubai, previously known as Downtown Burj Dubai, is a large-scale, mixed-use complex under development in Dubai, United Arab Emirates. It is the



home of some of the city's largest landmarks including Burj Khalifa, Dubai Mall, and Dubai Fountain. It covers an area of 2 square kilometres (0.77 sq mi), at an estimated cost of US\$20 billion (Dh73 billion) upon completion.

The development is situated along Sheikh Zayed Road, across from Al Wasl locality on the northwest. It is bounded to the south by Business Bay and to the northeast by Financial Centre Road, which separates it from Zabeel 2 and Trade Center 2.

Arabic low-rise vernacular style of architecture is present in the Old Town, while high-rise contemporary buildings dominate the rest of the development. Downtown Dubai offers a range of high-end hotels such as Address Downtown, Vida Downtown, Al Manzil Downtown, as well as attractions such as a luxury Arabian market, Souq Al Bahar and a 3.5 km-long strip of restaurants and cafes on Sheikh Mohammad bin Rashid Boulevard.

### Burj Khalifa

Burj Khalifa is the centrepiece of Downtown Dubai. At 828 m (2,717 ft), it is the tallest building in the world and the tallest man-made structure ever built.

Construction began on 21 September 2004, and was completed and ready for occupancy by 4 January 2010. Burj Khalifa is estimated to have cost US\$1.5 billion. In addition to being the tallest building in the world, Burj Khalifa holds six other world records, including ‘tallest free-standing structure in the world’, ‘elevator with the longest running distance in the world’ and ‘highest number of storeys in the world’.

### The Dubai Mall

#### Dubai Mall's interior

The Dubai Mall is the world's largest shopping mall by total area. It is the home of 1,200 shops in addition to numerous attractions, including an Olympic-size ice rink, an aquarium and a water zoo. In March 2018, the owner of The Dubai Mall, Emaar Malls opened an entertainment complex by the name of VR Park, which blends augmented reality and virtual reality (VR). Access to the mall is provided via Doha Street, rebuilt as a double-decker road in April 2009. The Dubai Mall opened on November 4, 2008, with about 600 retailers. The Dubai Mall is the most visited retail

destination in the United Arab Emirates with approximately 80,000,000 visitors annually.

### Fashion Avenue

In March 2018, Emaar Malls unveiled a new extension of The Dubai Mall dedicated to fashion and luxury shopping. The 440,000-square-foot Fashion Avenue offers over 150 prestigious brands, including Burberry, Cartier, Miu Miu, Prada, Gucci, Mikimoto, Faberge, Valentino, Christian Louboutin, to name a few.

### Dubai Fountain

At the center of Downtown Dubai and at a cost of Dh 800 million (US\$217 million), The Dubai Fountain is the largest choreographed system in the world. It was designed by WET Design, the California-based company responsible for the fountains at the Bellagio Hotel Lake in Las Vegas. Illuminated by 6,600 lights and 50 colored projectors, it will be 275 m (902 ft) long and able to shoot water 150 m (490 ft) into the air, accompanied by a range of classical to contemporary Arabic and world music. On 26 October 2008 Emaar announced, based on results of a naming contest, the fountain would be named the Dubai Fountain.

### Address Downtown Dubai

Address Downtown Dubai is a supertall skyscraper rising 306 meters (1,004 feet) alongside the Dubai Mall, the Old Town, and the Burj Khalifa Lake in Dubai, United Arab Emirates. This hotel and residential tower contains a total of 63 floors. The tower is another supertall structure in the massive development of Downtown Dubai, which includes the centerpiece supertall building, Burj Khalifa. The tower was topped out in April 2008, becoming the 6th-tallest building in Dubai and the 36th-tallest in the world. In September 2008 the tower was completed.

### Dubai Opera

In August 2016, Emaar opened Dubai Opera, a 2,000-seat, multi-format, performing arts center located within The Opera District of Downtown Dubai. Styled on the classic Arabian dhow, the project was developed by Emaar Properties in collaboration with architect Janus Rostock. The venue hosts a wide array of performances coming from countries around the world, including theatre, opera, ballet, concerts, musicals, stand-up comedy shows and various seasonal events. Its plans were announced by

Sheikh Mohammed bin Rashid Al Maktoum in March 2012. It opened on 31 August 2016 with a performance by Plácido Domingo.

#### Sheikh Mohammed bin Rashid Boulevard

Encircling Downtown Dubai, the 3.5 km road was previously known as Emaar Boulevard based on the area's developer. In December 2012, Emaar renamed the boulevard to pay tribute to His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai. The thoroughfare is famous for an impressive array of restaurants, cafes, and outdoor art exhibitions by Art Emaar, a cultural initiative of Emaar Properties.

#### The New Year's Gala

Held in the center of Downtown Dubai every year, Dubai's New Year's Gala is one of the most celebrated events in Dubai. The celebration usually comprises a massive firework display and gathers hundreds of thousands of residents and tourists. In 2018, Burj Khalifa's owner and the host of the event, Emaar hosted a special light and laser show 'Light Up 2018' which brought in over a million visitors and reached over 2.5 billion people through live television broadcast and live streams on social media. 'Light Up 2018' broke a world record for the 'largest light and sound show on a single building.'

#### Forte Towers

In May 2015, Emaar announced the twin tower project called Forte Towers – one of which will be a 70 storey building, making it the third tallest tower in the District.

#### Burj Vista

According to a newspaper article in 2013, Emaar has launched two identically designed towers located on Muhammad Bin Rashid Boulevard in Downtown Dubai. One tower is 20 storeys high and the other is 65 storeys. Both towers consist of 640 apartments. Burj Vista offers lavish terraces that open onto stupendous views of the city's skyline. Completion and handover is scheduled for February 2018.

The Pentominium is a 122-storey, 516 m (1,693 ft) supertall skyscraper on hold in Dubai, United Arab Emirates. Construction on the tower has been halted since August 2011. It was designed by Andrew Bromberg of architects Aedas and funded by Trident International Holdings. The AED 1.46 billion (US\$400 million) construction contract

was awarded to Arabian Construction Company (ACC). The Pentominium has one of the deepest excavations done in the world.

Construction started on 26 July 2009 and, before construction stopped, the building was expected to be completed in 2013. By May 2011, 22 floors had been completed. However, in August 2011, construction stopped after Trident International Holdings fell behind on payments for a US\$20.4 million loan following the global financial crisis. As of 2018, the tower still stands incomplete that construction will restart in 2019.

Had the project been completed as scheduled, the Pentominium would be the second tallest building in Dubai after Burj Khalifa as well as the tallest residential building in the world if completed before World One.

#### Projected residential height

The Pentominium would have been the tallest all-residential building in the world instead of the 432 Park Avenue upon completion if construction had resumed; it has the highest projected height of any residential building under construction. It has been described as "one of the most architecturally significant projects in the city currently under construction" due to the "large number of offset cantilevered spa gardens and apartments down one side which create an imbalance for the building and, as a result, some fairly significant building sways which have to be corrected during construction."

The project management contract was awarded to the project management firm Precipio.

#### Apartments and design

The word "pentominium" is a portmanteau of the words "penthouse" and "condominium". Each residential floor will have just one 4-bedroom apartment of over 600 m<sup>2</sup> (6,500 sq ft). Amenities available to residents would include a swimming pool, an observation deck, a private cinema, a health club and a banqueting hall, along with a cigar lounge and a business centre.

The Dubai Mall is a shopping mall in Dubai and the second-largest mall in the world by total land area, and the 21st-largest shopping mall in the world by gross leasable area. Located in Dubai, United Arab Emirates, it is part of the 20-billion-dollar

Downtown complex, and includes 1,200 shops. In 2011 it was the most visited building on the planet, attracting over 54 million visitors each year. Access to the mall is provided via Doha Street, rebuilt as a double-decker road in April 2009.

Twice delayed, Dubai Mall opened on 4 November 2008, with about 1000 retailers, marking the world's second largest-ever mall opening in retail history behind West Edmonton Mall. However it is not the largest in gross leasable space, and is surpassed in that category by several malls including the New South China Mall, which is the world's largest, Golden Resources Mall, SM City North Edsa, and SM Mall of Asia.

At over 13 million square feet, (equivalent in size to more than 50 football fields), the Dubai Mall has a total internal floor area of 5.9 million square feet (55 ha) and leasable space of 3.77 million square feet (35 ha), about the same as the West Edmonton Mall.

It also has a 250-room luxury hotel, 22 cinema screens plus 120 restaurants and cafes. The Mall has over 14,000 parking spaces across 3 car parks, with valet services and a car locator ticketing system. The mall has won five awards – two awards at the Retail Future Project Awards at Mapic, Cannes, in 2004, for Best Retail Development Scheme (Large) and Best Use of Lighting in a Retail Environment and the Dubai Mall brochure collected three awards at the Summit Creative Awards 2005 in Portland, Oregon – the Gold award for Best Art Direction / Graphic Design, Silver award for Best 4-colour B2B Brochure, and a Judges Special Recognition award.

Dubai Aquarium and Underwater Zoo

Dubai Aquarium and Under Water Zoo

Tunnel of Dubai Aquarium & Underwater Zoo

The Dubai Aquarium & Underwater Zoo was designed by Peddle Thorp and is managed by Emaar Entertainment. The aquarium, located in The Dubai Mall, showcases more than 300 species of marine animals, including sharks and rays.

The attraction was awarded with the 'Certificate of Excellence' and won the 'Images Most Admired Retailer of the Year – Leisure & Entertainment' at Images RetailME Awards 2012.

### VR Park Dubai

SEGA Republic, a 76,000 sq ft (7,100 m<sup>2</sup>) indoor theme park, was opened on 21 August 2009 where visitors can enjoy over 150 amusement games. It is a park that is mainly dedicated to SEGA's video game icon Sonic the Hedgehog.

The 76,000 sq ft indoor park features 15 rides and an array of amusement games, including motion simulators, classic carnival games, skill games, and a wide array of redemption games.

Recent additions to Sega Republic rides include Xyclone, Robotnik and Rope Rush, a form of an obstacle course.

The park includes 'Lazeraze', a laser maze, as well as 'Racer' Bumper Cars. It also features a "soft play area" for smaller children.

The theme park closed on June 1st, 2017, after the license to the Sega theme expired. It later reopened in February 2018 as a theme park dedicated to virtual reality under the name of VR Park Dubai.

### Reel Cinemas

Reel Cinemas is a 22-screen cinema, also managed by Emaar Entertainment, in The Dubai Mall.

One of the largest theaters in the region, the megaplex features four cinema suites and 17 commercial halls, including the first THX-certified cinema in Dubai.

### Rainforest Cafe

The interior of the Rainforest Cafe in the mall.

The Dubai Mall is home to one of the newest Rainforest Cafe locations. Having opened in 2009, it faces the aquarium and is made to emulate tropical ruins with moving ruins and light shows, which are only found at this location.

## Hysteria

Hysteria is a haunted house which is decorated with special effects, fog lights and strobe lights. The story of Hysteria revolves around a family whose child mysteriously disappeared. They believe that the guest knows where their child is, so they attempt to kidnap the guest or guests and subject them to a terrifying experience.

## Dubai Dino

Dubai Dino is a genuine fossil of *Diplodocus*, a large, long-necked dinosaur. The total measurement of the Dino is over 7 meters in height and 24 meters in length.

## Dubai Creek Tower Replica

The Dubai Mall's Grand Atrium is home to a replica of the Dubai Creek Tower, which is currently under construction. The model gives a 3D rendition of the completed tower's architecture and grandeur.

## KidZania

KidZania is an interactive children's sized edutainment theme park that encourages education through play. It offers youngsters the opportunity to experience adult life through role play in a child-sized city.

## Shops

The Dubai Mall contains more than 1,200 shops. The mall contains a wide variety of restaurants including: KFC, McDonalds, and Cheesecake Factory.

## Construction

The mall was built by a joint venture of Dutco Balfour Beatty, Al Ghandi/CCC and Turner Construction for Emaar Properties and was scheduled to be completed in 2006, claiming to be the size of 50 "international-sized football (soccer) pitches". Most of the workers used in construction of the mall were Indian, Pakistani, Bangladeshi and Sri Lankan guest workers.

## Metro Link

In December 2012, Emaar Properties announced the completion of the Metro Link, an 820 m long elevated, air-conditioned footbridge that connects the Burj Khalifa/Dubai Mall Metrostation to the mall.

## Expansion

In June 2013, the Dubai Mall commenced its phase one of its expansion plan by increasing the total retail floor area by 1 million sq. ft. so as to accommodate more visitors. The project was completed 2018.

## Dubai Silicon Oasis

free trade zone, government-owned incentivization zone in Dubai. Schools The Indian international school which is at DSO. part of DSO

Established in 2004, Dubai Silicon Oasis Authority (DSOA) is wholly owned by the Government of Dubai providing both a living and working integrated community. Silicon Oasis is a Free Zone Authority and provides free trade zone incentives and benefits to companies operating within the tech park.

Dubai Silicon Oasis' (DSO) spans 7.2 km<sup>2</sup>. The Authority has made a large capital investment in its infrastructure to cater to the need of high tech industries in the free zone, this ranges from advanced telecommunications, a fibre optic network, tier 3 data centre with 120 high capacity racks, and a high-tech utility infrastructure with 8 power stations with a capacity of 1600 MW.

The technology park possesses a combined fire, water and irrigation supply system which is supported by a pump station and a 5000 m<sup>3</sup> underground irrigation tank. A sanitary water network is also provided giving potable water supply of 44,525 m<sup>3</sup> per day based on an estimated 162,400 population working and/or living at the Silicon Oasis. DSO has a sewerage management system includes onsite pumping stations that transport wastewater to municipal plants through a new pressure pipeline. Current capacity of the sewage management system is 3,000 m<sup>3</sup> per day (of which the technology park currently uses approximately a third) with a planned expansion set to see the capacity increased to 10,000 m<sup>3</sup> to facilitate the community's future growth.

In addition, DSO has a network of roads allowing access to Dubai's major highways.

Dubai Studio City is part of Tecom Group in Dubai, UAE. Following in the footsteps of Dubai Media City, it will cater to the production needs of the region and has plans to build movie studios like Hollywood sound stages backlots for various production needs. It is located opposite the upmarket gated community of Arabian Ranches.



Dubai Media City and Dubai Studio City both belong to Dubai Holding subsidiary TECOM Investments. Dubai Studio City will have pre-built studios, sound stages, workshops, backlots and stage areas, a broadcast centre housing offices and post-production studios, and a business centre for freelancers. The cluster will also house film and television academies, location approval services, entertainment and retail spaces, and hotels and residential facilities to accommodate crews and casts. In 2008 Dubai Studio City hosted film program in Dubai with Manhattan Film Academy.

Dubai Healthcare City is a healthcare free economic zone situated in the Emirate of Dubai, United Arab Emirates. DHCC was launched in 2002 by Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai. DHCC was mandated by the government to meet the demand for high-quality, patient-centered healthcare, and the main aim is to attract tourists to Dubai for medical services and treatments.

Through strategic partnerships, DHCC provides a wide range of services in healthcare, medical education and research, pharmaceuticals, medical equipment, wellness and allied support.

DHCC comprises two phases. Phase 1 of DHCC is dedicated to healthcare and medical education and covers 4.1 million square feet. Phase 2, which is under development, is dedicated to wellness, and will cover 19 million square feet.

In 2014 alone, visits to DHCC were up 20 percent to 1.2 million from 1 million in 2013, of which 15 percent were medical tourists. According to DHCC, the most popular procedures sought by medical tourists to DHCC include infertility, cosmetic and dental treatments. Most medical tourists came to the DHCC from the Gulf Cooperation Council area (37 percent) and wider Arab world (25 percent), though 20 percent came from Europe and 18 from Asia.

## Healthcare

DHCC is home to 120 medical facilities including hospitals – Mediclinic City Hospital and Dr Sulaiman Al-Habib Hospital – more than 120 outpatient medical centers and diagnostic laboratories with more than 4,000 licensed professionals.

## Education and Research

Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU) is the first medical university of Dubai Healthcare City Authority located in Dubai Healthcare City free zone. The University comprises two colleges, the Hamdan Bin Mohammed College of Dental Medicine, and the College of Medicine; the colleges offer six postgraduate specialty dentistry programs and a Bachelor of Medicine and Bachelor of Surgery (MBBS) degree respectively. MBRU integrates education, clinical practice, and research to provide an innovative academic experience. It has the technology and learning resources in place that enrich students' experiences and journey. Learning resources include Al Maktoum Medical Library, that counts the rare 1867 volume of The Lancet in its permanent collection; the Khalaf Ahmad Al Habtoor Medical Simulation Center, the largest in the UAE, as well as dedicated research and anatomy labs. MBRU is accredited by the Ministry of Higher Education and Scientific Research in the United Arab Emirates, and the MBBS degree is listed on the World Directory of Medical Schools.

#### Investment

DHCC offers medical and healthcare providers with a 'one-stop shop' solution to set up operations and avail of free zone benefits. The investment product portfolio has clinical, commercial, retail, business centre and free-hold land.

#### Regulatory

Under DHCA, the Centre for Healthcare Planning and Quality (CPQ) is an independent regulatory body responsible for licensing healthcare providers and professionals, and setting and maintaining international best practice in healthcare delivery and patient care within DHCC.

The Dubai International Financial Centre (DIFC) is a special economic zone in Dubai covering 110 ha, established in 2004 and a financial hub for the Middle East, Africa and South Asia (MEASA) markets. DIFC has its own independent, internationally regulated regulator and judicial system, common law framework, global financial exchange, tax-friendly regime, and a large business community. The district houses hundreds of financial institutions, including wealth funds and private investors, but it also hosts multinationals, retail outlets, cafés, restaurants, residential space, public green spaces, hotels and art galleries.

DIFC is one of Dubai's independent free-zones; it offers companies 100% ownership without the need for a local partner. The district is governed by a common-law

framework distinct from the UAE legal system, with laws and regulations issued in English. DIFC offers clients a 50-year guarantee of zero taxes on corporate income and profits, complemented by the UAE's network of double taxation avoidance treaties.

### Independent jurisdiction

The DIFC is an independent jurisdiction under the UAE Constitution, with its own civil and commercial laws distinct from those of the wider UAE. DIFC laws and regulations are written in English and default to English law in the event of an ambiguity. The DIFC also has its own courts, with judges taken from leading common law jurisdictions including England, Singapore and Hong Kong. The DIFC's independent jurisdiction extends to a range of areas including corporate, commercial, civil, employment, trusts, and securities law matters. Other laws of the UAE or the Emirate of Dubai, such as criminal law and immigration regulations, continue to apply within the DIFC.

The DIFC-LCIA Arbitration Centre is an independent centre of international arbitration that uses rules modelled on the London Court of International Arbitration.

The principal governing body of the DIFC is the DIFC Authority. The financial services regulator is the Dubai Financial Services Authority (DFSA), which regulates the conduct of financial services in and from the DIFC. The DFSA is distinct from the UAE's federal Securities and Commodities Authority, whose jurisdiction covers the wider UAE outside the boundaries of the DIFC.

### International financial centre

Licence applications are considered from financial institutions in the sectors. The units offer benefits such as 0% tax on income and profits, 100% foreign ownership, no restrictions on foreign exchange or capital/profit repatriation, operational support and business continuity facilities.

One of the key elements of the centre is a privately held financial exchange that opened in September 2005 as Dubai International Financial Exchange (DIFX) but was rebranded as NASDAQ Dubai in the year 2008.

The trading hours of NASDAQ Dubai are from 10:00 am to 2:00 pm (06:00 am to 10:00 am GMT), from Sunday to Thursday.

Companies listed on NASDAQ Dubai include ordinary shares listed by DP World along with DEPA. DP World's initial public offering was the largest ever in the Middle East and raised \$4.96 billion; 15 times oversubscribed, it is one of the most valued companies in the Middle East Region.

NASDAQ Dubai is regulated by Dubai Financial Services Authority.

Dubai Knowledge Park is a human resources management, professional learning and educational free trade zone campus in the city of Dubai established in 2003, United Arab Emirates, that provides facilities for corporate training and learning institutions to operate with 100% foreign ownership. There are over 400 companies and institutions operating within it, which include occupational assessment and testing providers, universities, computer training providers, professional centers, executive development providers and HR consultancy companies. It is owned by Dubai Holding's subsidiary TECOM Investments. It is located in Al Sufouh 2 District.

In 2007, TECOM Investments launched a separate facility, Dubai International Academic City, where all institutions of higher education from Dubai Knowledge Park will be moved to.

Dubai Knowledge Park has previously been known as Knowledge Village.

Dubai Internet City is an information technology park created by the government of Dubai as a free economic zone and a strategic base for companies targeting regional emerging markets. The economic rules of DIC allow companies to avail themselves of a number of ownership, taxation and customs related benefits which are guaranteed by law for a period of 50 years. One model of operation includes 100% foreign ownership, similar to those prevailing in other designated economic zones in the United Arab Emirates. These freedoms have led many global information technology firms, such as Facebook, LinkedIn, Google, Dell, Intel, Huawei, Samsung, SAP, Microsoft, IBM, Oracle Corporation, Tata Consultancy, 3M, Sun Microsystems, Cisco, HP, Nokia, Cognizant and Accenture, as well as UAE based companies such as Ducont, to move their regional base to the DIC. DIC is located adjacent to other industrial clusters such as Dubai Media City and Dubai Knowledge Village.

DIC presently has over one and half million square feet of prime commercial office space, in which over 1400 companies with over 10,000 workers are based. There are 25 low, mid, and high-rise office structures in the area.

On 13 April 2008, du (EITC) announced that all of its traffic would be routed via the UAE's membership proxy which blocks access to any content deemed 'inappropriate'. du had been previously blocking VOIP services. While Dubai Internet City sells itself as a business-friendly environment with excellent low cost connectivity, the reality is one of a heavily censored internet with prices that are 5-10 times the price of connectivity in Europe or the USA. In addition to webpage censorship, it is speculated that a variety of popular social networking services are blocked. Cheap calls to the UAE are not possible due to a termination charge of around 17p UK, (around 30 US cents) per minute imposed by the UAE phone networks. Internet connectivity in Dubai is expensive; a 10 Mbit/s home connection costs 299 AED per month (USD82/-). The minimum internet connectivity package available for businesses at DIC is a 2Mbit/s connection with a 6GB monthly limit for around 800 AED (180 USD). Bandwidth beyond the 6GB limit is charged at a higher pro-rata rate than the first 6GB.

The UAE proxy can be bypassed by various methods including by setting up a VPN to connect securely to a server in another country to reduce the amount of Internet censorship, with the advantage that UAE authorities cannot 'snoop' on the traffic. While the UAE may block access to the web sites companies providing VPN services, it is possible to arrange overseas accounts. Such options significantly reduce costs as VOIP systems can be used; for companies who require access to services or content that is blocked, VPNs are a necessity.

Around 11.15 AM on January 30, 2008, a ship's anchor apparently severed fibre optic cables between Palermo, Italy, and Alexandria, Egypt. Providers across the Middle East and as far as Pakistan were heavily affected with a significant slowdown of communications reported. The UAE telecommunications company and Dubai Internet City's internet service provider du was one of the worst hit, becoming completely inoperational for several hours. Since du has a monopoly in the Free Zones, customers had no alternative connectivity during the outage.

History

Dubai Internet City, a member of Dubai Holding subsidiary TECOM Investments, was founded in October 1999, and it opened its doors in October 2000.

Dubai Internet City (DIC) provides a knowledge economy ecosystem designed to facilitate the business development of Internet and Communications Technology (ICT) companies. It is the Middle East's biggest ICT infrastructure, built inside a free trade zone.

The global ICT giants like Microsoft, Oracle Corporation, HP, IBM, Dell, Siemens, Canon, Logica, Sony Ericsson, Schlumberger and Cisco, as well as many small and medium enterprises and entrepreneurial ventures are based in DIC. The ICT cluster in Dubai Internet City comprises companies from sectors like software development, business services, e-commerce, consultancy and sales and marketing. Locally bred technology companies like Ducont FZ LLC, one of the earliest startups at DIC, have shown that innovation is possible in the region, and quite successfully so, at that.

The cluster environment of DIC provides most elements of the value chain for an ICT business. In addition, it has developed programmes that can be leveraged by the ICT community to explore and expand channel and business development opportunities.

### Economics

Dubai Internet City, like the whole of Dubai, has seen rapid growth, with the Emirate's GDP rising at double digit rates. However, since 2003 inflation has climbed rapidly too, making real GDP growth significantly lower. The latest official government figures (2006) state inflation of 9.6%. By spring 2008, the level is somewhere over 10%, and approaching 20% according to the estimates of some international banks.

The government has implemented price controls on rent rises as well as fuel and basic commodities such as rice, but these cannot be viewed as effective long term anti-inflation measures in a market economy. The UAE has continued to reiterate the commitment to pegging its currency to a continually weakening dollar, which rules out significant interest rate rises - the accepted inflation-fighting tool in developed countries. Federal Reserve interest rate cuts of 1.25% in January 2008 have been mirrored by the UAE Central Bank, which is certain to fuel inflation further and weaken the currency.

In March 2008, DIC announced a rental increase to 180 AED per square foot - a 25% rise (the government's rent cap on private landlords is 5% for 2008). The DIC statement accompanying the release said "operating costs have shot up recently due to economic growth in the region". It made no mention of the decision by the UAE government in November 2007 to hike federal government employees' salaries by 70%.. In late 2008, Dubai property prices began to crash heavily, falling by up to 50% over the next six months. Rents across the emirate fell heavily and many jobs were lost, particularly in real estate. Despite this, as of December 2009 DIC rents were not reduced. The present rent of 160 AED (July '11), including the service charge for electricity, is roughly double the rents available in the areas immediately outside DIC. From January 15, 2013 the RTA began charging workers and visitors to DIC, as well as Dubai Media City and Knowledge Village for parking, which had previously been provided free. In addition to charging fees for parking in car parks and designated parking areas, the authorities began activating parking meters on the streets, and in off-street areas. The move caused widespread concern among workers in DIC and the other TECOM areas.

#### Location

Dubai Internet City is about 25 kilometers south of downtown Dubai city, on Sheikh Zayed Road between Dubai and Abu Dhabi. It is located adjacent to Dubai Marina, Jumeirah Beach Residence and the well-known Palm Jumeirah, areas which are rapidly becoming three of the most exclusive (and expensive) residential areas of Dubai. DIC is less than 1 km from the sea coast and is near several five star hotels.

Ski Dubai is an indoor ski resort with 22,500 square meters of indoor ski area. The park maintains the temperature of -1 degree Celsius to 2 degrees Celsius through out the year. It is a part of the Mall of the Emirates, one of the largest shopping malls in the world, located in Dubai, United Arab Emirates. It was developed by Majid Al Futtaim Group, which also operates the Mall of the Emirates.

Opened in November 2005, the indoor resort features an 85-metre-high indoor mountain (equivalent to 25 stories high building) with 5 slopes of varying steepness and difficulty, this is 80 sq. meter wide, including a 400-metre-long run, the world's first indoor black diamond run, and various features (boxes, rails, kickers) that are changed on a regular basis. A quad lift and a tow lift carry skiers and snowboarders up the mountain. All the equipment, such as skis and jackets are provided with the ticket and you can buy equipment in the nearby stores. Adjoining the slopes is a 3,000-

square-metre Snow Park play area comprising sled and toboggan runs, an icy body slide, climbing towers, giant snowballs and an ice cave. Ski Dubai also houses a number of penguins who are let out of their enclosures several times a day. Penguin encounters can be booked, allowing the public to interact directly with the penguins.

In 2007 Ski Dubai was awarded the Thea Outstanding Achievement Award by the Themed Entertainment Association. The Snow Play Area was designed and produced by Thinkwell Group.

Mall of the Emirates is a shopping mall in Dubai. Developed and owned by Majid Al Futtaim Properties, it opened in November 2005 and is located at interchange four on Sheikh Zayed road.

The multi-level shopping mall currently features more than 630 retail outlets, 7900 parking spaces, over 100 restaurants & Cafes, 80 luxury stores and 250 flagship stores. It has a total gross leasable area of 255,489 square meters. It also hosts family leisure activities including Ski Dubai (the Middle East's first indoor ski resort and snow park), the 500-seat capacity Dubai Community Theatre and Arts Centre and Magic planet, one of the largest indoor family entertainment centres in Dubai.

In November 2005, it was named the World's Leading New Shopping Mall at the World Travel Awards in London. Forbes has also recognized Mall of the Emirates as one of the top five shopping malls in Dubai.

#### Dubai Community Theatre and Arts Centre

Dubai Community Theatre and Arts Centre (DUCTAC) is a non-profit, cross-community creative centre that opened in November 2006, under the patronage of Princess Haya bint Hussein. It was spread over 7,424 square metres on the second floor of the Mall of the Emirates. There were two-level theatre and rehearsal spaces, along with an arts centre housing galleries, classrooms, studios, music school, library and high specification visual arts gallery.

In July 2018, Dubai Community Theatre & Arts Centre (DUCTAC) closed at the Mall of the Emirates.

#### VOX Cinemas

VOX Cinemas has a 14-screen multiplex cinema at Mall of the Emirates, including 2 VOX Gold screens. VOX Cinemas is owned and operated by Majid Al Futtaim



Cinemas. It is located in the new expansion area at Mall of the Emirates level 2 and consists of 24- screens including an IMAX with Laser theatre, Vox Kids, 4DX Cinema and Theatre by Rhodes.

### Magic Planet

Magic Planet is an indoor family entertainment centre with two entertainment zones for children and young adults. It has a ten-pin bowling alley with 12 lanes, pool and billiard tables, 180 amusement machines, and other attractions including a carousel, racing simulators, Jumping Star, soft play and bumper cars. It also includes the RoboCoaster (a two-person thrill ride unique to the Middle East) and XD Dark Ride, a "7D" adventure with 3D movie graphics and 4D effects including motion, wind and light.

### Expansion

Mall of the Emirates' AED 1 billion multi-stage redevelopment project, Evolution 2015, completed in September 2015. The new Fashion District featuring 30 contemporary brands marked the completion of Phase 1. Phase 2 has added a second taxi rank located next to Ski Dubai on level 4. Phase 3, unveiled a new retail extension on Level 2 – an additional 36,000sqm of retail space added to include 40 new retailers

On 10 September 2013, Mall of the Emirates announced a multi-stage redevelopment project worth an estimated AED 1 billion (US \$274 million), which is called as Evolution 2015. Phase one of the project which will increase 5,000 sqm area more is already completed but expected to open in mid-2015 includes new shopping, dining and entertainment concepts. However, due to the limitations of its location, the mall will be expanded upwards by constructing a second floor on top of the Carrefour area.

On 25 August 2014, Mall of the Emirates announced phase two of its strategic redevelopment project, Evolution 2015 which is now currently underway. In this stage, the mall will be expanded by gross leasable area of 26,000 meter sq. This project includes an additional of 1300 new spaces for car parking, 12 new restaurants, new prayer rooms for both, men and women and the relocation of the current VOX Cinemas which will now have 24 screens.

The new expansion project "Evolution 2015" was officially opened on 28 September 2015 which increased the gross leasable area to 26,000 meter sq. On 30 September

2015, David Beckham visited the mall for the inauguration of the Adidas store which was built in the newly expanded section.

The Burj Khalifa, known as the Burj Dubai prior to its inauguration in 2010, is a skyscraper in Dubai, United Arab Emirates. With a total height of 829.8 m (2,722 ft) and a roof height (excluding antenna) of 828 m (2,717 ft), the Burj Khalifa has been the tallest structure and building in the world since its topping out in late 2008.

Construction of the Burj Khalifa began in 2004, with the exterior completed five years later in 2009. The primary structure is reinforced concrete. The building was opened in 2010 as part of a new development called Downtown Dubai. It is designed to be the centrepiece of large-scale, mixed-use development. The decision to construct the building is based on the government's decision to diversify from an oil-based economy, and for Dubai to gain international recognition. The building was originally named Burj Dubaibut was renamed in honour of the ruler of Abu Dhabi and president of the United Arab Emirates, Khalifa bin Zayed Al Nahyan; Abu Dhabi and the UAE government lent Dubai money to pay its debts. The building broke numerous height records, including its designation as the tallest building in the world.

Burj Khalifa was designed by Adrian Smith, of Skidmore, Owings & Merrill, whose firm designed the Willis Tower and One World Trade Center. Hyder Consulting was chosen to be the supervising engineer with NORR Group Consultants International Limited chosen to supervise the architecture of the project. The design is derived from the Islamic architecture of the region, such as in the Great Mosque of Samarra. The Y-shaped tripartite floor geometry is designed to optimize residential and hotel space. A buttressed central core and wings are used to support the height of the building. Although this design was derived from Tower Palace III, the Burj Khalifa's central core houses all vertical transportation with the exception of egress stairs within each of the wings. The structure also features a cladding system which is designed to withstand Dubai's hot summer temperatures. It contains a total of 57 elevators and 8 escalators.

At a certain point in the architectural and engineering process, the original Emaar developers ran into financial issues, and required more money and economic funding. Sheikh Khalifa, the ruler of the United Arab Emirates, granted monetary aid and funding, hence resulting in the changing of the name to "Burj Khalifa". The concept of profitability derived from building high density developments and malls around the landmark have proven successful. Its surrounding malls, hotels and condominiums in

Downtown Dubai have generated the most considerable revenue from the project as a whole, while the Burj Khalifa itself made little or no profit.

Critical reception to Burj Khalifa has been generally positive, and the building has received many awards. There were complaints concerning migrant workers from South Asia who were the primary building labor force. These centered on low wages and the practice of confiscating passports until duties were complete.

The tower was designed by Skidmore, Owings and Merrill (SOM), which also designed the Willis Tower in Chicago and the One World Trade Center in New York City. Burj Khalifa uses the bundled tube design of the Willis Tower, invented by Fazlur Rahman Khan. Due to its tubular system, proportionally only half the amount of steel was used in the construction, compared to the Empire State Building. Khan's contributions to the design of tall buildings have had a profound impact on architecture and engineering. It would be difficult to find any worldwide practices in the design of tall buildings that have not been directly or indirectly influenced by his work. The design is reminiscent of Frank Lloyd Wright's vision for The Illinois, a mile-high skyscraper designed for Chicago, as well as Chicago's Lake Point Tower. When Adrian Smith was conceiving the project at SOM, he looked out his office window toward Lake Point Tower's curved three wing layout, "There's the prototype", he said. According to Strabala, Burj Khalifa was designed based on the 73 floor Tower Palace Three, an all-residential building in Seoul. In its early planning, Burj Khalifa was intended to be entirely residential.

Subsequent to the original design by Skidmore, Owings and Merrill, Emaar Properties chose Hyder Consulting to be the supervising engineer and NORR Group Consultants International Ltd to supervise the architecture of the project. Hyder was selected for their expertise in structural and MEP (mechanical, electrical and plumbing) engineering. Hyder Consulting's role was to supervise construction, certify the architect's design, and be the engineer and architect of record to the UAE authorities. NORR's role was the supervision of all architectural components including on-site supervision during construction and design of a 6-story addition to the office annex building for architectural documentation. NORR was also responsible for the architectural integration drawings for the Armani Hotel included in the Tower. Emaar Properties also engaged GHD, an international multidisciplinary consulting firm, to act as an independent verification and testing authority for concrete and steelwork.

The design is derived from Islamic architecture. As the tower rises from the flat desert base, there are 27 setbacks in a spiral pattern, decreasing the cross section of the tower as going upward and creating convenient outdoor terraces. These setbacks are arranged and aligned in a way that minimizes vibration wind loading from eddy currents and vortices. At the top, the central core emerges and is sculpted to form a finishing spire. At its tallest point, the tower sways a total of 1.5 m (4.9 ft).

### The spiral minaret at the Great Mosque of Samarra

The spire of Burj Khalifa is composed of more than 4,000 tonnes (4,400 short tons; 3,900 long tons) of structural steel. The central pinnacle pipe weighs 350 tonnes (390 short tons; 340 long tons) and has a height of 200 m (660 ft). The spire also houses communications equipment. This 244-metre spire is widely considered vanity height, since very little of its space is usable. Without the spire, Burj Khalifa would be 585 meters tall. This was reported in a Council on Tall Buildings and Urban Habitat study, which notes that the empty spire "could be a skyscraper on its own". Such a skyscraper, if located in Europe, would be the 11th tallest building on that continent.

In 2009, architects announced that more than 1,000 pieces of art would adorn the interiors of Burj Khalifa, while the residential lobby of Burj Khalifa would display the work of Jaume Plensa.

The cladding system consists of 142,000 m<sup>2</sup> (1,528,000 sq ft) of more than 26,000 reflective glass panels and aluminium and textured stainless steel spandrel panels with vertical tubular fins. The architectural glass provides solar and thermal performance as well as an anti-glare shield for the intense desert sun, extreme desert temperatures and strong winds. The glass covers more than 174,000 m<sup>2</sup> (1,870,000 sq ft) in area. The Burj's typical curtain wall panels measure 4'6" wide by 10'8" high and weigh about 800 pounds each, with wider panels near the buildings edges and taller ones near the top.

The exterior temperature at the top of the building is thought to be 6 °C (11 °F) cooler than at its base.

A 304-room Armani Hotel, the first of four by Armani, occupies 15 of the lower 39 floors. The hotel was supposed to open on 18 March 2010, but after several delays, it finally opened to the public on 27 April 2010. The corporate suites and offices were

also supposed to open from March onwards, yet the hotel and observation deck remained the only parts of the building which were open in April 2010.

The sky lobbies on the 43rd and 76th floors house swimming pools. Floors through to 108 have 900 private residential apartments (which, according to the developer, sold out within eight hours of being on the market). An outdoor zero-entry swimming pool is located on the 76th floor of the tower. Corporate offices and suites fill most of the remaining floors, except for the 122nd, 123rd and 124th, where the At.mosphere restaurant, sky lobby and an indoor and outdoor observation deck are located respectively. In January 2010, it was planned that Burj Khalifa would receive its first residents from February 2010.

The building has 57 elevators and 8 escalators. The elevators have a capacity of 12 to 14 people per cabin, the fastest rising and descending at up to 10 m/s (33 ft/s) for double-deck elevators. However, the world's fastest single-deck elevator still belongs to Taipei 101 at 16.83 m/s (55.2 ft/s). Engineers had considered installing the world's first triple-deck elevators, but the final design called for double-deck elevators. The double-deck elevators are equipped with entertainment features such as LCD displays to serve visitors during their travel to the observation deck. The building has 2,909 stairs from the ground floor to the 160th floor.

### Plumbing systems

The Burj Khalifa's water system supplies an average of 946,000 L (250,000 U.S. gal) of water per day through 100 km (62 mi) of pipes. An additional 213 km (132 mi) of piping serves the fire emergency system, and 34 km (21 mi) supplies chilled water for the air conditioning system. The waste water system uses gravity to discharge water from plumbing fixtures, floor drains, mechanical equipment and storm water, to the city municipal sewer.

### Air conditioning

The air conditioning system draws air from the upper floors where the air is cooler and cleaner than on the ground. At peak cooling times, the tower's cooling is equivalent to that provided by 13,000 short tons (26,000,000 lb) / 13,000 short tons (12,000,000 kg) of melting ice in one day, or about 46 MW. Water is collected via a condensate collection system and is used to irrigate the nearby park.

## Window cleaning

To wash the 24,348 windows, totaling 120,000 m<sup>2</sup> (1,290,000 sq ft) of glass, the building has three horizontal tracks which each holding a 1,500 kg (3,300 lb) bucket machine. Above level 109, and up to tier 27, traditional cradles from davits are used. The top of the building is cleaned by a crew that uses ropes to descend from the top to gain access. Under normal conditions, when all building maintenance units are operational, it takes 36 workers three to four months to clean the entire exterior.

Unmanned machines clean the top 27 additional tiers and the glass spire. The cleaning system was developed in Melbourne, Australia at a cost of A\$8 million. The contract for building the cleaning machines was won by Australian company CoxGomyl, a manufacturer of building maintenance units.

## The Dubai Fountain

Outside, WET Enterprises designed a fountain system at a cost of Dh 800 million (US\$217 million). Illuminated by 6,600 lights and 50 coloured projectors, it is 270 m (900 ft) long and shoots water 150 m (500 ft) into the air, accompanied by a range of classical to contemporary Arabic and other music. It is the world's second largest choreographed fountain. On 26 October 2008, Emaar announced that based on results of a naming contest the fountain would be called the Dubai Fountain.

## Observation deck

### View of The Dubai Fountain from the observation deck

### View from the observation deck

An outdoor observation deck, named At the Top, opened on 5 January 2010 on the 124th floor. At 452 m (1,483 ft), it was the highest outdoor observation deck in the world when it opened. Although it was surpassed in December 2011 by Cloud Top 488 on the Canton Tower, Guangzhou at 488 m (1,601 ft), Burj Khalifa opened the

148th floor SKY level at 555 m (1,821 ft), once again giving it the highest observation deck in the world on 15 October 2014, until the Shanghai Tower opened in June 2016 with an observation deck at a height of 561 metres. The 124th floor observation deck also features the electronic telescope, an augmented reality device developed by Gsmprjct° of Montréal, which allows visitors to view the surrounding landscape in real-time, and to view previously saved images such as those taken at different times of day or under different weather conditions. To manage the daily rush of sightseers, visitors are able to purchase tickets in advance for a specific date and time and at a 75% discount on tickets purchased on the spot. Tickets start at 135 AED, or 36.75 USD.

On 8 February 2010, the observation deck was closed to the public for two months after power-supply problems caused an elevator to become stuck between floors, trapping a group of tourists for 45 minutes. When the tide is low and visibility is high, people can see the shores of Iran from the top of the skyscraper.

#### Burj Khalifa park

Burj Khalifa is surrounded by an 11 ha (27-acre) park designed by landscape architects SWA Group. Like the tower, the park's design was based on the flower of the *Hymenocallis*, a desert plant. At the centre of the park is the water room, which is a series of pools and water jet fountains. Benches and signs incorporate images of Burj Khalifa and the *Hymenocallis* flower.

The plants are watered by water collected from the building's cooling system. The system provides 68,000,000 L (15,000,000 imp gal) annually. WET Enterprises, who also developed the Dubai Fountain, developed the park's six water features.

The tower was constructed by Samsung C&T from South Korea, which also did work on the Petronas Twin Towers and Taipei 101. Samsung C&T built the tower in a joint venture with BESIX from Belgium and Arabtec from the UAE. Turner was the project manager on the main construction contract.

The contractor and the engineer of record was Hyder Consulting. Under UAE law, the contractor and the engineer of record is jointly and severally liable for the performance of Burj Khalifa.

The primary structure is reinforced concrete. Putzmeister created a new, super high-pressure trailer concrete pump, the BSA 14000 SHP-D, for this project. Burj Khalifa's

construction used 330,000 m<sup>3</sup> (431,600 cu yd) of concrete and 55,000 tonnes (61,000 short tons; 54,000 long tons) of steel rebar, and construction took 22 million man-hours. In May 2008 Putzmeister pumped concrete with more than 21 MPA ultimate compressive strength of gravel to surpass the 600 meters weight of the effective area of each column from the foundation to the next fourth level, and the rest was by metal columns jacketed or covered with concrete to a then world record delivery height of 606 m (1,988 ft), the 156th floor. Three tower cranes were used during construction of the uppermost levels, each capable of lifting a 25-tonne load. The remaining structure above was constructed of lighter steel.

In 2003, 33 test holes were drilled to study the strength of the bedrock underlying the structure. "Weak to very weak sandstone and siltstone" was found, just metres below the surface. Samples were taken from test holes drilled to a depth of 140 metres, finding weak to very weak rock all the way. The study described the site as part of a "seismically active area".

Over 45,000 m<sup>3</sup> (58,900 cu yd) of concrete, weighing more than 110,000 tonnes (120,000 short tons; 110,000 long tons) were used to construct the concrete and steel foundation, which features 192 piles; each pile is 1.5 metre in diameter by 43 m in length, buried more than 50 m (164 ft) deep. The foundation was designed to support the total building weight of approximately 450,000 tonnes (500,000 short tons; 440,000 long tons). This weight was then divided by the compressive strength of concrete of which is 30 MPa which yielded a 450 sq.meters of vertical normal effective area, which then yielded to a 12 meters by 12 meters dimensions. A cathodic protection system is under the concrete to neutralize the groundwater and prevent corrosion.

The Burj Khalifa is highly compartmentalised. Pressurized, air-conditioned refuge floors are located every 13 floors (in floors G, 13, 26, 39, 52 etc.) where people can shelter on their long walk down to safety in case of an emergency or fire.

Special mixes of concrete were made to withstand the extreme pressures of the massive building weight; as is typical with reinforced concrete construction, each batch of concrete was tested to ensure it could withstand certain pressures.

CTLGroup, working for Skidmore, Owings and Merrill, conducted the creep and shrinkage testing critical for the structural analysis of the building.



The consistency of the concrete used in the project was essential. It was difficult to create a concrete that could withstand both the thousands of tonnes bearing down on it and Persian Gulf temperatures that can reach 50 °C (122 °F). To combat this problem, the concrete was not poured during the day. Instead, during the summer months, ice was added to the mixture and it was poured at night when the air was cooler and the humidity was higher. Cooler concrete cures more evenly and is therefore less likely to set too quickly and crack. Any significant cracks could have put the entire project in jeopardy.

Port Rashid , also referred to as Mina Rashid, is a man made, commercial port in Dubai, United Arab Emirates. Named after Sheikh Rashid bin Saeed Al Maktoum, the port opened in 1972. At the time the port only had two gantry cranes and a capacity of less than 100,000 TEUs. In 1978, the port was expanded to include 35 berths (five of which were able to be used by the largest container ships at the time). Today, the port has 9 gantry cranes and a capacity of 1,500,000 TEUs.

Today, Port Rashid provides berths for general cargo, RoRo and passenger vessels. In the early 1980s, Port Rashid was supplemented by Port of Jebel Ali, which is further from the commercial centre of Dubai near the Abu Dhabi border.

Adjacent to the port are Dubai Drydocks and Dubai Maritime City. Both of these facilities were built due to Port Rashid's proximity. But, in January 2008, it was announced that the port would be redeveloped. All cargo operations will move to Jebel Ali Port by the end of March 2018. Port Rashid will turn into a cruise terminal. Also, part of the port will be reclaimed by Nakheel to create "a vibrant mixed use urban waterfront" that will house 200,000 residents.

The government's decision to diversify from a trade-based but oil-reliant economy to one that is service- and tourism-oriented resulted in the property boom from 2004–2008. Construction on a large scale has turned Dubai into one of the fastest-growing cities in the world. Expatriates of various nationalities brought capital into Dubai in the early 2000s. Iranian expatriates were estimated to have invested up to \$200 billion in Dubai. From 2005 to 2009, trade between Dubai and Iran tripled to \$12 billion. The property boom is largely driven by megaprojects such as the off-shore Palm Islands and The World, and the inland Dubai Marina, Burj Khalifa complex, Dubai Waterfront, Business Bay, Dubailand and Jumeirah Village.

The Jumeirah Palm, the world's largest man-made island.

Dubai is home to skyscrapers such as Emirates Towers, which are the 12th and 24th tallest buildings in the world, and the Burj-al-Arab hotel, located on its own artificial island and currently the world's fifth tallest and most expensive hotel.

Emaar Properties constructed world's current tallest structure, the Burj Khalifa. The height of the skyscraper is 828 m (2,717 ft) tall, with 160 floors. Adjacent to Burj Khalifa is the Dubai Mall, which at the time of construction was the world's largest shopping mall.

Also under construction is what is planned to become Dubai's new central business district, named Business Bay. The project, when completed, will feature 500 skyscrapers built around an artificial extension of the existing Dubai Creek.

In February 2005, the construction of Dubai Waterfront was announced, it will be 2½ times the size of Washington, D.C., roughly seven times the size of the island of Manhattan. Dubai Waterfront will be a mix of canals and islands full of hotels and residential areas that will add 800 km (500 mi) of man-made waterfront. It will also contain Al Burj, another one of the tallest buildings in the world.

Dubai has also launched Dubai Science Park (previously DuBiotech and merged with EnPark). This is a new business park to be targeted at biotechnology companies working in pharmaceuticals, medical fields, genetic research and biodefense.

One of Dubai's plans in 2006 was for a 30-story, 200 apartment skyscraper that will slowly rotate at its base, making a 360 degree revolution once a week. The world's first rotating skyscraper was to be in the center of the Dubailand complex.

There are over 300 stores in the Gold Souk.

The International Media Production Zone is a project targeted at creating a hub for printers, publishers, media production companies, and related industry segments. Launched in 2003, the project was scheduled to be completed in 2006.

In May 2006 the Bawadi was announced, with a planned 27 billion US-dollar investment intended to increase Dubai's number of hotel rooms by 29,000, doubling it

from the current figure offers now. The largest complex was to be called "Asia, Asia" and was planned to be the largest hotel in the world with more than 6,500 rooms.

The first villa freehold properties that were occupied by non-UAE nationals were The Meadows, The Springs, and The Lakes (high-end neighbourhoods designed by Emaar Properties, collectively called Emirates Hills).

Expatriates of various nationalities brought capital into Dubai in the early 2000s. Iranian expatriates were estimated to have invested up to \$200 billion in Dubai. From 2005 to 2009, trade between Dubai and Iran tripled to \$12 billion.

Dubai nationals have also purchased real estate in New York City and London. Purchases in 2005 included New York's 230 Park Avenue (formerly known as the New York Central Building or the Helmsley Building) and Essex House on Central Park South.

The Dubai property boom of the mid-2000s peaked in 2008 and plummeted in a wave of activity which saw large scale projects, including partially completed properties, abandoned. Many developers failed, while others, including those with government backing, entered into debt-restructuring deals with their lenders. By 2012 the market began picking up steam again. 2013 was a stellar year with prices accelerating significantly, however the government and industry players began putting in place measures that would safeguard against another bubble developing. One notable difference is the number of cash buyers compared to those in previous years that borrowed heavily. Part of the reason for the current cash surge is the influx of investment from troubled countries.

In September 2013, the Dubai Land Department increased property transfer fees from 2 to 4%. In early 2014 the government regulator imposed restrictions on outside-companies acquiring real estate in the emirate, insisting such companies had to have a presence in Dubai, and had to be owned by a natural person or persons, and not by another company. The measures were largely seen as a means to dampen speculation in property prices.

## Construction

Since 2000, Dubai's municipality has initiated construction phases in the city, predominantly in the Mina Seyahi area, located further from Jumeirah, towards Jebel Ali. This has come at a cost however. Dubai ( and UAE ) construction companies

employ low-wage labourers from Asia for up to 12 hours a day, six or seven days a week. These workers often have their passports withheld and are threatened if they speak to media. During the 1990s and 2000s, many workers staged protests and those who were expats were deported.

In 2002 a change was made to the law allowing non-nationals of the UAE to own property (not land) in Dubai as fee simple, and 99-year leases are sold to people with ownership remaining with private companies. Property companies include Nakheel Properties and Emaar Properties. Rent rises were capped at 7% per annum up to 2007 under a directive from Mohammed bin Rashid Al Maktoum. Legislation in this area is still developing as the property market for foreigners is relatively new.

### Diamonds

Dubai has become the world's third largest diamond trading hub, with trade of rough and cut diamonds increasing since 2001. The emirate's diamond trade was virtually nonexistent at the beginning of the 2000s, but was worth nearly \$35 billion in 2013 and 2014. The emirate has been able to leverage off its geographical position between major supplies of mined diamonds in Africa, to the main cutting centres in India and further east in China. There is also a perception of Dubai as a buying hub for consumers of diamonds jewellery, due to the large number of jewellers in the emirate and the tax-free business regime. The diamond trading takes on an exchange managed by the Dubai Multi Commodities Centre, with many of the industry participants housed in office space in the Almas Tower in the JLT business cluster. Facilities there include Kimberley Process Certification offices and access to secure transportation agencies such as Brinks and Transguard, in addition to networking and meeting rooms.

### Gold

Trade in gold grew during the 1940s due to Dubai's free trade policies that encouraged entrepreneurs from India and Iran to set up stores in the Dubai Gold Souk. Despite a general slump in the global gold market, Dubai's share of value of trade in gold and diamonds to its total non-oil direct trade increased from 18% in 2003, to 24% in 2004. In 2003, the value of trade in gold in Dubai was approximately Dh. 21 billion (US\$5.8 billion), while trade in diamonds was approximately Dh. 25 billion (US\$7 billion) in 2005. India is Dubai's largest buyer of gold, accounting for approximately 23% of the emirate's total gold trade in 2005. Switzerland was Dubai's largest supplier of gold

ingots, wastes and scrap. Similarly, India accounted for approximately 68% of all diamond-related trade in Dubai; Belgium's share in Dubai's diamond trade was about 13% (2005).

### Industry and manufacturing

Dubai is also home to some significant industrial ventures in energy production through DEWA, although this is primarily water and power production for Dubai. In the aluminium industry Emirates Global Aluminium produces 2.4 million tonnes of aluminium per year (~\$3.8B USD in revenue). There is also investment in car manufacturing with Zarooq Motors; the start of UAE car industry. Production and sales are due to begin in 2016. Dubai Ports is also an example of industrialization in Dubai.

## Africa

Africa has a population of roughly 1.018 billion and a surface of 30,221,532 km<sup>2</sup>. Industrialization started marginally in the early 20th century in the colonies of the European nations, namely Portugal, Belgium, Spain, the Netherlands, Germany, France, Italy, and the United Kingdom. The continent's various wars for independence brought on the violent and disruptive division of Africa. Africa, being a major source of raw materials, saw the colonial powers vie for influence among the newly independent nations, with former colonial powers establishing special relations with their former colonies, often by offering economic aid and alliances for access to the vast resources of their former territories.

Today, the presence of diamonds, gold, silver, uranium, cobalt and large oil reserves have brought Africa to the forefront of industrial development, with many of the world's economic powers building relations with Africa's resource rich nations.

As of 2008, the entire GDP of Africa is about \$1.2 trillion.

The United Nations predicts Africa's economic growth will reach 3.5% in 2018 and 3.7% in 2019. As of 2007, growth in Africa had surpassed that of East Asia. Data suggest parts of the continent are now experiencing fast growth, thanks to their resources and increasing political stability and 'has steadily increased levels of peacefulness since 2007'. The World Bank reports the economy of Sub-Saharan African countries grew at rates that match or surpass global rates. According to the United Nations Department of Economic and Social Affairs, the improvement in the region's aggregate growth is largely attributable to a recovery in Egypt, Nigeria and South Africa, three of Africa's largest economies.

The economies of the fastest growing African nations experienced growth significantly above the global average rates. The top nations in 2007 include Mauritania with growth at 19.8%, Angola at 17.6%, Sudan at 9.6%, Mozambique at

7.9% and Malawi at 7.8%. Other fast growers include Rwanda, Mozambique, Chad, Niger, Burkina Faso, Ethiopia. Nonetheless, growth has been dismal, negative or sluggish in many parts of Africa including Zimbabwe, the Democratic Republic of the Congo, the Republic of the Congo and Burundi. Many international agencies are increasingly interested in investing in emerging African economies. especially as Africa continues to maintain high economic growth despite current global economic recession. The rate of return on investment in Africa is currently the highest in the developing world.

Debt relief is being addressed by some international institutions in the interests of supporting economic development in Africa. In 1996, the UN sponsored the Heavily Indebted Poor Countries (HIPC) initiative, subsequently taken up by the IMF, World Bank and the African Development Fund (AfDF) in the form of the Multilateral Debt Relief Initiative (MDRI). As of 2013, the initiative has given partial debt relief to 30 African countries.

Trade has driven much of the growth in Africa's economy in the early 21st century. China and India are increasingly important trade partners; 12.5% of Africa's exports are to China, and 4% are to India, which accounts for 5% of China's imports and 8% of India's. The Group of Five (Indonesia, Malaysia, Saudi Arabia, Thailand, and the United Arab Emirates) are another increasingly important market for Africa's exports.

Africa's economy—with expanding trade, English language skills (official in many Sub-Saharan countries), improving literacy and education, availability of splendid resources and cheaper labour force—is expected to continue to perform better into the future. Trade between Africa and China stood at US\$166 billion in 2011.

Africa will only experience a "demographic dividend" by 2035, when its young and growing labour force will have fewer children and retired people as dependents as a proportion of the population, making it more demographically comparable to the US and Europe. It is becoming a more educated labour force, with nearly half expected to have some secondary-level education by 2020. A consumer class is also emerging in Africa and is expected to keep booming. Africa has around 90 million people with household incomes exceeding \$5,000, meaning that they can direct more than half of their income towards discretionary spending rather than necessities. This number could reach a projected 128 million by 2020.

During the President of the United States Barack Obama's visit to Africa in July 2013, he announced a US\$7 billion plan to further develop infrastructure and work more intensively with African heads of state. A new program named Trade Africa, designed to boost trade within the continent as well as between Africa and the U.S., was also unveiled by Obama.

According to the researchers at the Overseas Development Institute, the lack of infrastructure in many developing countries represents one of the most significant limitations to economic growth and achievement of the Millennium Development Goals (MDGs). Infrastructure investments and maintenance can be very expensive, especially in such areas as landlocked, rural and sparsely populated countries in Africa.

It has been argued that infrastructure investments contributed to more than half of Africa's improved growth performance between 1990 and 2005 and increased investment is necessary to maintain growth and tackle poverty. The returns to investment in infrastructure are very significant, with on average 30–40% returns for telecommunications (ICT) investments, over 40% for electricity generation, and 80% for roads.

In Africa, it is argued that to meet the MDGs by 2015, infrastructure investments would need to reach about 15% of GDP (around \$93 billion a year). Currently, the source of financing varies significantly across sectors. Some sectors are dominated by state spending, others by overseas development aid (ODA) and yet others by private investors. In sub-Saharan Africa, the state spends around \$9.4 billion out of a total of \$24.9 billion.

In irrigation, SSA states represent almost all spending; in transport and energy a majority of investment is state spending; in Information and communication technologies and water supply and sanitation, the private sector represents the majority of capital expenditure. Overall, aid, the private sector and non-OECD financiers between them exceed state spending. The private sector spending alone equals state capital expenditure, though the majority is focused on ICT infrastructure investments. External financing increased from \$7 billion (2002) to \$27 billion (2009). China, in particular, has emerged as an important investor.



African countries suffer from communication difficulties caused by language diversity. Greenberg's diversity index is the chance that two randomly selected people would have different mother tongues. Out of the most diverse 25 countries according to this index, 18 (72%) are African. This includes 12 countries for which Greenberg's diversity index exceeds 0.9, meaning that a pair of randomly selected people will have less than 10% chance of having the same mother tongue. However, the primary language of government, political debate, academic discourse, and administration is often the language of the former colonial powers; English, French, or Portuguese.

Dependency theory asserts that the wealth and prosperity of the superpowers and their allies in Europe, North America and East Asia is dependent upon the poverty of the rest of the world, including Africa. Economists who subscribe to this theory believe that poorer regions must break their trading ties with the developed world in order to prosper.

Less radical theories suggest that economic protectionism in developed countries hampers Africa's growth. When developing countries have harvested agricultural produce at low cost, they generally do not export as much as would be expected. Abundant farm subsidies and high import tariffs in the developed world, most notably those set by Japan, the European Union's Common Agricultural Policy, and the United States Department of Agriculture, are thought to be the cause. Although these subsidies and tariffs have been gradually reduced, they remain high.

Local conditions also affect exports; state over-regulation in several African nations can prevent their own exports from becoming competitive. Research in Public Choice economics such as that of Jane Shaw suggest that protectionism operates in tandem with heavy State intervention combining to depress economic development. Farmers subject to import and export restrictions cater to localized markets, exposing them to higher market volatility and fewer opportunities. When subject to uncertain market conditions, farmers press for governmental intervention to suppress competition in their markets, resulting in competition being driven out of the market. As competition is driven out of the market, farmers innovate less and grow less food further undermining economic performance

Although Africa and Asia had similar levels of income in the 1960s, Asia has since outpaced Africa, with the exception of a few extremely poor and war-torn countries like Afghanistan and Yemen. One school of economists argues that Asia's superior economic development lies in local investment. Corruption in Africa consists

primarily of extracting economic rent and moving the resulting financial capital overseas instead of investing at home; the stereotype of African dictators with Swiss bank accounts is often accurate. University of Massachusetts Amherst researchers estimate that from 1970 to 1996, capital flight from 30 sub-Saharan countries totalled \$187bn, exceeding those nations' external debts. This disparity in development is consistent with the model theorized by economist Mancur Olson. Because governments were politically unstable and new governments often confiscated their predecessors' assets, officials would stash their wealth abroad, out of reach of any future expropriation.

Socialist governments influenced by Marxism, and the land reform they have enacted, have also contributed to economic stagnation in Africa. For example, the regime of Robert Mugabe in Zimbabwe, particularly the land seizures from white farmers, led to the collapse of the country's agricultural economy, which had formerly been one of Africa's strongest; Mugabe had been previously supported by the USSR during the Rhodesian Bush War. In Tanzania, socialist President Julius Nyerere resigned in 1985 after his policies of agricultural collectivisation in 1971 led to economic collapse, with famine only being averted by generous aid from the IMF and other foreign entities. Tanzania was left as one of the world's poorest and most aid-dependent nations, and has taken decades to recover. Since the abolition of the socialist one-party state in 1992 and the transition to democracy, Tanzania has experienced rapid economic growth, with growth of 6.5% in 2017.

Food shipments in case of dire local shortage are generally uncontroversial; but as Amartya Sen has shown, most famines involve a local lack of income rather than of food. In such situations, food aid—as opposed to financial aid—has the effect of destroying local agriculture and serves mainly to benefit Western agribusiness which are vastly overproducing food as a result of agricultural subsidies.

Historically, food aid is more highly correlated with excess supply in Western countries than with the needs of developing countries. Foreign aid has been an integral part of African economic development since the 1980s.

The aid model has been criticized for supplanting trade initiatives. Growing evidence shows that foreign aid has made the continent poorer. One of the biggest critics of the aid development model is economist Dambiso Moyo (a Zambian economist based in the US), who introduced the Dead Aid model, which highlights how foreign aid has been a deterrent for local development.

Today, Africa faces the problem of attracting foreign aid in areas where there is potential for high income from demand. It is in need of more economic policies and active participation in the world economy. As globalization has heightened the competition for foreign aid among developing countries, Africa has been trying to improve its struggle to receive foreign aid by taking more responsibility at the regional and international level. In addition, Africa has created the 'Africa Action Plan' in order to obtain new relationships with development partners to share responsibilities regarding discovering ways to receive aid from foreign investors.

The African Union is the largest international economic grouping on the continent. The confederation's goals include the creation of a free trade area, a customs union, a single market, a central bank, and a common currency (see African Monetary Union), thereby establishing economic and monetary union. The current plan is to establish an African Economic Community with a single currency by 2023. The African Investment Bank is meant to stimulate development. The AU plans also include a transitional African Monetary Fund leading to an African Central Bank. Some parties support development of an even more unified United States of Africa.

International monetary and banking unions include:

- Central Bank of West African States
- Bank of Central African States
- Common Monetary Area

After an initial rebound from the 2009 world economic crisis, Africa's economy was undermined in the year 2011 by the Arab uprisings. The continent's growth fell back from 5% in 2010 to 3.4% in 2011. With the recovery of North African economies and sustained improvement in other regions, growth across the continent is expected to accelerate to 4.5% in 2012 and 4.8% in 2013. Short-term problems for the world economy remain as Europe confronts its debt crisis. Commodity prices—crucial for Africa—have declined from their peak due to weaker demand and increased supply, and some could fall further. But prices are expected to remain at levels favourable for African exporter.

Economic activity has rebounded across Africa. However, the pace of recovery was uneven among groups of countries and subregions. Oil-exporting countries generally expanded more strongly than oil-importing countries. West Africa and East Africa were the two best-performing subregions in 2010.

Intra-African trade has been slowed by protectionist policies among countries and regions. Despite this, trade between countries belonging to the Common Market for Eastern and Southern Africa (COMESA), a particularly strong economic region, grew six-fold over the past decade up to 2012. Ghana and Kenya, for example, have developed markets within the region for construction materials, machinery, and finished products, quite different from the mining and agriculture products that make up the bulk of their international exports.

The African Ministers of Trade agreed in 2010 to create a Pan-Africa Free Trade Zone. This would reduce countries' tariffs on imports and increase intra-African trade, and it is hoped, the diversification of the economy overall.

he situation whereby African nations export crops to the West while millions on the continent starve has been blamed on developed countries including Japan, the European Union and the United States. These countries protect their own agricultural sectors with high import tariffs and offer subsidies to their farmers, which many contend leads the overproduction of such commodities as grain, cotton and milk. The result of this is that the global price of such products is continually reduced until Africans are unable to compete, except for cash crops that do not grow easily in a northern climate.

In recent years countries such as Brazil, which has experienced progress in agricultural production, have agreed to share technology with Africa to increase agricultural production in the continent to make it a more viable trade partner. Increased investment in African agricultural technology in general has the potential to reduce poverty in Africa. The demand market for African cocoa has experienced a price boom in 2008. The Nigerian, South African and Ugandan governments have targeted policies to take advantage of the increased demand for certain agricultural products and plan to stimulate agricultural sectors. The African Union has plans to heavily invest in African agriculture and the situation is closely monitored by the UN.

Africa has significant resources for generating energy in several forms (hydroelectric, reserves of petroleum and gas, coal production, uranium production, renewable energy such as solar, wind and geothermal). The lack of development and infrastructure means that little of this potential is actually in use today. The largest consumers of electric power in Africa are South Africa, Libya, Namibia, Egypt, Tunisia, and Zimbabwe, which each consume between 1000 and 5000 KWh/m<sup>2</sup> per person, in contrast with African states such as Ethiopia, Eritrea, and Tanzania, where electricity consumption per person is negligible.

Petroleum and petroleum products are the main export of 14 African countries. Petroleum and petroleum products accounted for a 46.6% share of Africa's total exports in 2010; the second largest export of Africa as a whole is natural gas, in its gaseous state and as liquified natural gas, accounting for a 6.3% share of Africa's exports.

Lack of infrastructure creates barriers for African businesses. Although it has many ports, a lack of supporting transportation infrastructure adds 30–40% to costs, in contrast to Asian ports. Many large infrastructure projects are underway across Africa. By far, most of these projects are in the production and transportation of electric power. Many other projects include paved highways, railways, airports, and other construction.

Telecommunications infrastructure is also a growth area in Africa. Although Internet penetration lags other continents, it has still reached 9%. As of 2011, it was estimated that 500,000,000 mobile phones of all types were in use in Africa, including 15,000,000 "smart phones".

The mineral industry of Africa is one of the largest mineral industries in the world. Africa is the second biggest continent, with 30 million km<sup>2</sup> of land, which implies large quantities of resources. For many African countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, cobalt, industrial diamond, phosphate rock, platinum-group metals (PGM), vermiculite, and zirconium. Gold mining is Africa's main mining resource.

African mineral reserves rank first or second for bauxite, cobalt, diamonds, phosphate rocks, platinum-group metals (PGM), vermiculite, and zirconium. Many other

minerals are also present in quantity. The 2005 share of world production from African soil is the following: bauxite 9%; aluminium 5%; chromite 44%; cobalt 57%; copper 5%; gold 21%; iron ore 4%; steel 2%; lead (Pb) 3%; manganese 39%; zinc 2%; cement 4%; natural diamond 46%; graphite 2%; phosphate rock 31%; coal 5%; mineral fuels (including coal) & petroleum 13%; uranium 16%.

Both the African Union and the United Nations have outlined plans in modern years on how Africa can help itself industrialize and develop significant manufacturing sectors to levels proportional to the African economy in the 1960s with 21st-century technology. This focus on growth and diversification of manufacturing and industrial production, as well as diversification of agricultural production, has fueled hopes that the 21st century will prove to be a century of economic and technological growth for Africa. This hope, coupled with the rise of new leaders in Africa in the future, inspired the term "the African Century", referring to the 21st century potentially being the century when Africa's vast untapped labor, capital, and resource potentials might become a world player.

This hope in manufacturing and industry is helped by the boom in communications technology and local mining industry in much of sub-Saharan Africa. Namibia has attracted industrial investments in recent years and South Africa has begun offering tax incentives to attract foreign direct investment projects in manufacturing.

Africa's US\$107 billion financial services industry will log impressive growth for the rest of the decade as more banks target the continent's emerging middle class. The banking sector has been experiencing record growth, among others due to various technological innovations.

China and India have showed increasing interest in emerging African economies in the 21st century. Reciprocal investment between Africa and China increased dramatically in recent years amidst the current world financial crisis.

The increased investment in Africa by China has attracted the attention of the European Union and has provoked talks of competitive investment by the EU. Members of the African diaspora abroad, especially in the EU and the United States, have increased efforts to use their businesses to invest in Africa and encourage African investment abroad in the European economy.

Remittances from the African diaspora and rising interest in investment from the West will be especially helpful for Africa's least developed and most devastated economies, such as Burundi, Togo and Comoros. However, experts lament the high fees involved in sending remittances to Africa due to a duopoly of Western Union and MoneyGram that is controlling Africa's remittance market, making Africa is the most expensive cash transfer market in the world. According to some experts, the high processing fees involved in sending money to Africa are hampering African countries' development.

Angola has announced interests in investing in the EU, Portugal in particular. South Africa has attracted increasing attention from the United States as a new frontier of investment in manufacture, financial markets and small business, as has Liberia in recent years under their new leadership.

There are two African currency unions: the West African Banque Centrale des États de l'Afrique de l'Ouest (BCEAO) and the Central African Banque des États de l'Afrique Centrale (BEAC). Both use the CFA franc as their legal tender. The idea of a single currency union across Africa has been floated, and plans exist to have it established by 2020, though many issues, such as bringing continental inflation rates below 5 percent, remain hurdles in its finalization.

As of 2012, Africa has 23 stock exchanges, twice as many as it had 20 years earlier. Nonetheless, African stock exchanges still account for less than 1% of the world's stock exchange activity. The top ten stock exchanges in Africa by stock capital are (amounts are given in billions of United States dollars):

- South Africa (82.88)(2014)
- Egypt (\$73.04 billion (30 November 2014 est.))
- Morocco (5.18)
- Nigeria (5.11) (Actually has a market capitalisation value of \$39.27Bln)
- Kenya (1.33)
- Tunisia (0.88)
- BRVM (regional stock exchange whose members include Benin, Burkina Faso, Guinea-Bissau, Ivory Coast, Mali, Niger, Senegal and Togo: 6.6)
- Mauritius (0.55)

- Botswana (0.43)
- Ghana (.38)

Between 2009 and 2012, a total of 72 companies were launched on the stock exchanges of 13 African countries.

The African Union is the largest international economic grouping on the continent. The confederation's goals include the creation of a free trade area, a customs union, a single market, a central bank, and a common currency (see African Monetary Union), thereby establishing economic and monetary union. The current plan is to establish an African Economic Community with a single currency by 2023. The African Investment Bank is meant to stimulate development. The AU plans also include a transitional African Monetary Fund leading to an African Central Bank. Some parties support development of an even more unified United States of Africa.

International monetary and banking unions include:

- Central Bank of West African States
- Bank of Central African States
- Common Monetary Area

Women play a critical role in food security in this region by fulfilling their role as food providers. There are 3 basic variants of household food production systems in Sub-Saharan Africa: 1) Women are responsible for production of all or most food crops. In this variant, food plots are considered women's plot. 2) Men and women jointly cultivate staple food crops in fields controlled by male household heads. In this type, male household head controls the output. 3) Men are responsible for food production, while women specialize in food processing. This variant is mainly encountered where Islamic practices of female seclusion prevent women from engaging in fieldwork.

In many countries in Africa, there is a rigid division of labor by gender in agriculture. This division may be based on types of activities performed on the farm or type of crops grown by men and women. The division of labor is based on patriarchal norms that typically require women to care for the needs of the members of the households



while men are involved in bringing cash income to the household. Women are also expected to help fathers, husbands in their fields, which increase women's workload. Sometimes men will help women in clearing their plots to prepare the land.

In regions where women and men work on separate plots growing different crops, women are usually engaged in subsistence farming to provide food to fulfill the needs of the members of household while men are engaged in production of cash or export crops. In the early 21st century, this pattern is prevalent in several Sub-Saharan African countries like Tanzania, Uganda, Cameroon, Burkina Faso etc. This distinction can be explained as a result of gender norms that assign women with the responsibility of feeding family and men with the responsibility of providing cash income.

In Southeast Nigeria, for example, there exist distinctions between traditionally "male" and "female crops. "Female" crops are normally ephemeral household crops, and include cassava, beans, maize, plantains, and cocoyams. "Male" crops, meanwhile, include food staples such as yams, which are also considered the "prestige" crop.

Though women mainly grow food crops for household consumption, if there is any marketable surplus they sell it in the market. However, women's primary responsibility is to feed the family and only after that they can engage in other income earning activities. The distinction between crops is sometimes not very clear especially in the case of maize which is a staple crop in several Sub-Saharan African countries as well as a cash crop. With the introduction of high yielding varieties of maize, now the distinction is that the high yielding varieties tend to be men's crop and local varieties are women's crop. This pattern has been observed in Malawi where local varieties of maize are woman's crop while hybrid varieties are cash crops cultivated by men. The logic is the same: high yielding varieties provide large amount of marketable surplus which allows men to provide cash income while women continue with varieties that provide enough for subsistence consumption.

Women's role is not limited to food production, they are also required to process and prepare the food they grow, perform care work in the household and also help men in their cash crop production.

As for division of labor by tasks, traditionally, men cleared the forests, burned the bush, tended and harvested the fruits of tree crops such as the oil palm, fenced fields

against wild animals, and in some regions planted crops. Women are responsible for weeding, post-harvest production, and food preparation. Women are also responsible for transporting and marketing the cash crops with male members of the household. In a study for Kenya in the 1980s, it was reported that women were mainly responsible for hand digging, harvesting and transporting the crops while men were responsible for building the granary. However, gradually the distinction between men's and women's tasks is becoming quite blurred. There are very few tasks that are done exclusively by men like clearing of field. Women perform most tasks on their plots from sowing, weeding to harvesting, and may get some assistance from men in clearing and preparing the land for cultivation. On a man's plot, women may provide help in weeding, harvesting etc.

There is also some evidence that the roles of men in subsistence agriculture were traditionally somewhat greater in many regions before the period following the introduction of additional New World crops such as maize and cassava. In contrast to certain older traditional and indigenous staple food crops like yams or millet which tended to, and continued to be, grown mainly by men or with more male involvement (sometimes grown along with, varying by region, supplementary food crops often grown with more female involvement such as cocoyams or sometimes rice), certain new crops were often grown with more female involvement. The introduction of cash crops as well as of wage labor during the colonial period (also incentivized partly by colonial-era taxes in cash), and the formation of a more cash-based economy, tended to further lessen the participation of men in subsistence farming, as they increasingly participated in those newer more lucrative occupations in order to acquire and provide cash for their families at home. Nevertheless, men's traditional involvement in subsistence farming tended generally to be somewhat greater in West Africa than in Central and much of East Africa .

The gender roles and responsibilities in subsistence economies of Sub-Saharan Africa are dynamic and change with new economic situations. One of the important change noted in the first decade of 21st century is increased participation of women in agriculture as men migrate to work outside of agriculture. For example, in Kenya, Jolou women in the 1980s performed more tasks that were originally considered 'male' tasks. Also when men move to non-farm activities, women become more involved in cash cropping. As a result, the gender division of labor by crop and tasks becomes less rigid.

The change in roles is more uni-directional as when economic situation changes it does not appear that men are taking over household activities or production of subsistence crops. Men will increase their participation in women's activities only if some profitable economic opportunity arises. In Burkina Faso, men are becoming involved in picking of Shea nuts which was traditionally women's activity as in the 1980s the sale of these nuts has become highly profitable.

The proportion of female-headed households surged significantly since the 1990s. However, the majority of those are de facto headed households and arise because male heads migrate in search of other income-earning opportunities. The proportion of female-headed households varies from 12.9 percent in Niger to 39.3 percent in Namibia between 1998 and 2003. The female-headed households tend to be more heterogeneous. On an average, they tend to be small in size, have lower incomes and be less likely to adopt technology.

Household headship plays an important role in agricultural productivity. To the extent female-headed households are smaller, it may be that they are less productive than male-headed households due to shortage of labor especially in peak seasons. The causality may be reversed as well. If the household was poor and had low incomes, the male head migrated to find other opportunities. Further, as these households have lower incomes, their ability to adopt technology is also restricted. A study in Zambia finds a negative relationship between female headship and fertilizer adoption.

The land tenure systems in Africa vary across the continent. Both women's access to land and security of women's land tenure affects overall productivity. Traditionally, land may be allocated through lineage or village heads which is a model which still persists despite increasing private or state ownership of land. In patrilineal lineages women have access to land through male relatives. For example, in the Beti of Southern Cameroon, women cannot inherit land. They are granted food plots by their husbands but they are not allowed to plant cash crops. When allocations are made by village heads, a lot depends on their perception of different individuals' need for land. To the extent that women are perceived to be less capable of farming their allocations are smaller.

Overall, women's access to land in African societies is quite restricted, even in cases where the law protects women's rights to land, traditional customs inhibit their access and control over land. An example from Mozambique points out that customary law protects single-women and widowed women in access to land. However, there are

customs that constrain women's access to land. Single-women can gain access to land through their fathers, brothers or uncles. But, upon marriage in patriarchal communities women's access to land held by these relatives is lost, as they are expected to have access to land through their husbands. Generally, women tend to have smaller land holdings and less fertile plots.

Finally, control over land is an important factor which explains the large differences in investments on land made by men and women. A woman who may have obtained land through her husband may be hesitant to invest in technology if she perceives her marriage to be unstable. In Zambia, if a marriage is dissolved the land reverts to the lineage and woman has only a limited claim on the land. Among the Haya of Tanzania, women farm grassland plots but do not have permanent rights to the land.

According to the agricultural intensification hypothesis, as the population pressure increases and agricultural production moves away from a more traditional practice to a more tool based or mechanized (use of plough) farming, role of women in agriculture declines. However, this decline in women's role is more in relative terms than in absolute terms. With increased capital intensification like increased use of tractors and ox implements, acreage increases and that implies women have to do more weeding and harvesting and increased work of caring for domestic animals, thus, more labor demands from women.

Besides tools, fertilizers and pesticides may be quite useful in increasing productivity. Fertilizer use depends on: availability and farmer's resources to purchase. As women farmers generally have less access to cash and credit, they are less likely to purchase and use fertilizers. Research in Burkina Faso on men and women who grew same crop on individual plots showed that most of the inputs such as hired labor, fertilizers, tools went to man's plot. A study from Cameroon and Malawi shows that the structural adjustment programs that remove fertilizer subsidy affect female farmers more than male farmers as they reduce fertilizer application on maize, which is a female crop.

According to the World Development Report published by the World Bank in 2012, Africa's economy is about the size of the Netherlands' economy, which is equivalent to only approximately six percent of the U.S. economy. Akin Iwayemi, a professor at University of Ibadan in Nigeria, suggests that there is potentially a "strong feedback relationship between the energy sector and the national economy." Determining socio-economic indicators in Africa include population, population density, land area,

proportion of citizens living in an urban setting, and Gross Domestic Product (GNP) per capita.

Overall, the African continent is a net energy exporter. In 2009 the net energy export was 40% of the energy production 13,177 TWh. The world share of energy production in Africa was 12% of oil and 7% of gas in 2009

Energy in Africa is a scarcer commodity than in the developed world – annual consumption is 518 KWh in Sub-Saharan Africa, the same amount of electricity used by an individual in an Organization for Economic Cooperation and Development (OECD – example is the U.S.) country in 25 days. More than 500 million people live without electricity. Across the continent only 10% of individuals have access to the electrical grid, and of those, 75% come from the richest two quintiles in overall income. Less than 2% of the rural populations of Malawi, Ethiopia, Niger, and Chad have access to electrical power. Electrical provisioning in Africa has generally only reached wealthy, urban middle class, and commercial sectors, bypassing the region's large rural populations and urban poor. According to the forum of Energy Ministers of Africa, most agriculture still relies primarily on humans and animals for energy input. The electrical industry in Africa faces the economic paradox that raising prices will prohibit access to their services, but that they cannot afford to roll out additional infrastructure to drive prices down and increase access without additional capital.

Overall rates of access to energy in Africa have held constant since the 1980s, while the rest of the developing world has seen electrical grid distribution increase by 20%. Sub-Saharan Africa is the only region in the world where per-capita access rates are falling. According to recent trends, over 60% of Sub-Saharan Africans will still lack access to electricity by 2020.

Moreover, Africa has an average electrification rate of 24%, while the rate in the rest of the developing world lies closer to 40%. Even in the areas covered by the electrical grid, power is often unreliable: the manufacturing sector loses power on average 56 days out of the year. In Senegal power is out 25 days a year, in Tanzania 63 days, and in Burundi 144 days. Frequent power outages cause damage to sales, equipment, and discourage international investment. According to the periodical African Business, "Poor transport links and irregular power supplies have stunted the growth of

domestic companies and discouraged foreign firms from setting up manufacturing plants in the continent."

Despite its unreliability, electrical service in Sub-Saharan Africa also costs more than in other parts of the world. The protective tariff required in Sub-Saharan Africa is \$0.13 USD, compared to \$0.04–0.08 USD in the rest of the developing world. Additionally, one of the greatest challenges in an effort to create sustainable development in Africa is that many countries with exportable resources are land-locked without a system of transportation.

Although Africa lacks a sufficient transport system, new developments in industry and manufacturing have resulted in tremendous population growth, increased urbanization, high energy consumption, over-cultivation of lands, and significant industrial advancements engendered by globalization. Professor Iwayemi of University of Ibadan in Nigeria states that the "fundamental energy question facing Africa ...providing and maintaining widespread access of the population to reliable and affordable supplies of environmentally cleaner energy to meet the requirements of rapid economic growth and improved living standards." In correspondence to The Africa Society, the population growth of sub-Saharan Africa is 2.2% annually; therefore, by 2025, it is estimated that Africa will consist of over a billion people. If this mathematical model is correct environmental problems could double or even triple by 2025.

Perhaps a confounding variable of these trends is that less than 1% of the electricity generated in the Africa originates from renewable resources, as the White Paper on Energy Policy proclaims. The main objectives of the paper were to "increase access to affordable energy services, improve energy governance, stimulate economic growth, manage energy-related environmental impacts, and ensure security of supply through diversification."

The African continent features many sustainable energy resources, of which only a small percentage have been harnessed. 5–7% of the continent's hydroelectric potential has been tapped, and only 0.6% of its geothermal. The publication *Energy Economics* estimates that replacing South African coal power with hydroelectric imported from the Democratic Republic of the Congo could save 40 million tons of carbon dioxide emissions annually. 2011 estimates place African geothermal capacity

at 14,000 MW, of which only 60 MW has been tapped. The African Energy Policy Research Network calculates that biomass from agricultural waste alone could meet the present electrical needs of 16 south eastern countries with bagasse-based cogeneration. The sugar industry in Mauritius already provides 25% of the country's energy from byproduct cogeneration, with the potential for up to 13 times that amount with a widespread rollout cogeneration technology and process optimization.

According to Stephen Karekezi, Director of African Energy Policy Research Network and co-worker Waeni Kithyoma, Africa is third largest in crude oil reserves (behind the Middle East and Latin America), third largest in natural gas resources (behind the Middle East and Europe), second greatest for uranium (behind Australia), and is plentiful in hydro energy potentials and other renewable energy, such as bio-energy and solar energy. Professor Iwayemi states that there are conventional energy sources in Africa: hydroelectric and wood fuels, coal lignite, crude oil, natural gas and nuclear fuels, and there are unconventional energy sources, such as solar, geothermal, biomass, oil and tar sands, wind energy and tidal energy from the influence of the sea.

In addition, South Africa alone obtains the sixth largest coal reserves on the planet, after China, the US, India, Russia and Australia. Specific renewable resources in South Africa include solar, wind, hydropower, wave energy, and bio-energy.

Professor Iwayemi suggests that “commercial energy use remains a key factor in human development.” Commercial energy can include solar powered systems and the like.

In addition, The Africa Society admits that much of Africa's apparent facilitation of poverty is the result of degradation of agriculture and arable lands, as well as, the mismanagement of water resources. A large contributing factor to these events and others, such as famine, is deforestation. Clean energy potentiality in Africa could therefore reduce environmental degradation, and consequently, poverty.

To provide an example, implementation of biodiesel technology has potential for the creation of jobs, as well as consequent economic development in disadvantaged rural communities. This form of clean energy also enables energy security for many nations throughout the globe including those in Africa, and reduces greenhouse gas emissions rather significantly.

North Africa is dominant in oil and in gas, for Libya obtains approximately 50% of the oil reserves available in Africa. Libya designated USD \$5 billion to assert programs and regulations that will reduce carbon emissions. Resources, such as oil and gas, are also prevalent in Algeria, in addition to natural gas. According to the Renewable Energy Sector in N. Africa, solar capacity is also extremely relevant in North Africa. The total power installed in North Africa region was roughly 61.6 GW in 2012. This is mostly made up of hydro accounting for nearly 10%.

Southern Africa has 91 percent of all of Africa's coal reserves and 70% of the nuclear/uranium resources in Africa, according to Professor Iwayemi. Southern Africa follows Central Africa closely in hydro resources; hydroelectric potential can particularly be found in the Congo DRC, Mozambique, Zambia, Cameroon, Ethiopia, Sudan, and Nigeria. Mozambique in particular has joined an international initiative to develop an energy action plan, to contribute to Sustainable Energy for All.

In accordance with The Africa Society, USAID's Living in the Finite Environment program has helped form 15 protected areas in Southern Africa, encompassing nearly 40,000 community members, known as conservancies in Namibia.

The country of South Africa alone obtains the sixth largest coal reserves on the planet, after China, the US, India, Russia and Australia. Specific renewable resources in South Africa include solar, wind, hydro power, wave energy, and bio-energy.

As of 2017, Zambia is in a massive power crisis that began in June. In Lusaka the eight-hour blackouts cause families to cook on a simple charcoal fire. The reason for this is poor rainfall, causing less hydroelectric output.

The Africa Society portrays that promotion of sustainable use of natural resources is occurring in Kenya and in Uganda; Kenya and Uganda are "improving community-based wildlife management, strengthening forestry and environmental management, and enhancing integrated coastal zone management...reduces conflicts between communities and protected areas by promoting access rights, revenue sharing..." etc. Kenya also organized an instrumental energy plan to support development and economic growth.

In Tanzania, the goal is to conserve biodiversity. "The USAID supports local actions in the Pangani, Bagamoyo, and Mkuranga districts that promote sustainable coastal



and marine resources management through co-management for near-shore fishery areas, small-scale enterprise development, marine culture, and coastal tourism.” There is also an essential push for geothermal power in East Africa, given the arid climate.

Norway also supports the replacement of kerosene lamps with alternatives facilitated from solar power in Kenya, access to energy in Ethiopia’s rural areas for job growth and a better standard of living, and Liberia’s implementation of a climate plan.

Electricity access in Ghana increased 500% between 1991 and 2000, but per capita consumption actually fell over the same period, suggesting electricity usage was unaffordable. Ghana was also one of the primary countries to develop an energy action plan, in response to the initiative for Sustainable Energy for All.

Nigeria is currently a dumping ground for electronic products, which leach toxic metals and substances such as lead, mercury, cadmium, arsenic, antimony, and trioxide into water sources. When burned, carcinogenic dioxins and polyaromatic hydrocarbons are emitted and toxic chemicals like barium are transmitted into the soil. The 1989 Basel Convention established an international treaty designed to regulate hazardous waste from being dumped into the developing world.

In reflection of statements made in Prof. Iwayemi’s essay, West Africa does have some coal reserves – approximately 10 percent of coal in Africa, particularly Nigeria. West Africa also exhibits some nuclear resources. In addition to coal reserves, Nigeria contains natural gas and oil resources.

“In Guinea, West Africa, the US is making significant input in the area of environmental protection.” These progressive steps will improve agricultural production technologies and exchange trade opportunities. “In Guinea 115,000 hectares of forests and tree plantations have been placed under sustainable management...USAID has assisted more than 37,000 farmers to improve agricultural production through sustainable management practices, and has helped establish over 2,800 new businesses.”

Central Africa has abundant hydro-electric resources due to the multiple rivers that run through this region. The publication *Energy Economics* estimates that replacing South African coal power with hydroelectric imported from the Democratic Republic of the Congo could save 40 million tons of carbon dioxide emissions annually.

Africa is protecting forest resources. “USAID will contribute approximately \$48 million to partnership through its successful Central African Regional Program for the Environment (CARPE)...goal is to improve forest governance, develop sustainable means of livelihood for 60 million people who live in the Basin, reduce the rate of forest degradation and loss of biodiversity through protected area management, improve logging policies, and achieve sustainable forest use by local inhabitants.”

Most development initiatives work at the individual project level, leading to fragmentation and inconsistency between projects that discourage long term investors. Institutional reform is vital to improving the operating efficiency of the electrical sector as a whole. The current hybrid public/private model lacks a clear leading organization with one clear vision of the system's future. Attempts to negotiate management contracts over utility hardware have generally failed, leaving the public utility still burdened with day-to-day hardware support as well as growth, planning, and development. Of 17 high profile African energy management contracts, four were cancelled before they even reached full term, five were not renewed after only one cycle, and five more were dropped in later years. Only three remain in place today.

Smart utility management must meet increased investment in the middle to smartly allocate resources and develop a sustainable grid model. Of the current utilities, "On average, Africa's state-owned power utilities embody only 40% of good governance practices for such enterprise".

Nevertheless, federal support for energy is gaining momentum, especially in Southern Africa. South Africa's government has established a Joint Implementation Committee to progress the biodiesel industry. This committee encompasses a variety of sub-committees, like “South Renewable Energy Technologies for Poverty Alleviation South Africa: Solar Water Heaters and Biodiesel,” and the “African Petroleum Industry Association. Plans for the promotion of harvest to create bioethanol are underway, the South African Bureau of Standards is developing pricing models to enable economic growth.

“The World Bank and the International Finance Corporation will expand existing programs such as Lighting Africa, which develops off-grid lighting markets, to provide affordable lighting to 70 million low-income households by 2020, as well as

undertake new initiatives with the Energy Sector Management Assistance Program, such as mapping of renewable energy resources”.

The Global Ministerial Environment Forum in Nairobi, Kenya was broadcast throughout Africa, and comprised a panel of energy experts who discussed the successes achieved in energy in Africa so far, lessons learned from implementations, and future projections for energy.

Moreover, the United Nations Development Program and UN Capital Development Fund recently initiated a global Clean Start program, which will enable millions of impoverished people both in Africa and in Asia to shift out of energy poverty by creating microfinance opportunities to encourage poorer individuals to purchase and utilize electricity. Twenty-five countries in Africa have joined this global task: Botswana, Burundi, Burkina Faso, Cape Verde, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Namibia, Nigeria, São Tomé and Príncipe, Senegal, Sierra Leone, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

Creating an effective and far reaching modern electrical system in Africa will take significant investment. The African Development Bank has estimated that a universal access system for all 53 countries in Africa would cost \$547 billion USD total to implement by 2030, which averages to \$27 billion USD per year. Total investment has not come close to this mark, instead hovering until recently between \$1–2 billion USD annually. Recent participation from China and India on the order of \$2 Billion USD annually brings the investment total up to ~\$4 billion USD. The power sector still faces a finance gap on the order of \$23 billion USD per year though, severely constraining its development options. Operating at 1/4 of the necessary budget to grow and expand, current networks must mark most funds for maintenance of aging existing systems.

Africa's current account surplus amounted to 2.3% of its GDP in 2005 versus 0.1% of GDP in 2004. In 2005, sub-Saharan countries ran an average deficit of 0.6% of the GDP, and countries in the Arab Maghreb Union ran an average surplus of 12.2% of GDP. Trade surpluses in oil-exporting countries more than offset trade deficits in oil-importing countries.

Oil-importing countries had an average current account deficit of 3.3% of the GDP in 2005, and oil-exporting countries had an average current account surplus of 12.2% of

GDP. Out of 33 African nations for which information was available, 20 countries experienced a decline in their terms of trade between 2002 and 2005 and 13 experienced an improvement. Oil importers experienced the worst decline. However, Botswana's terms of trade improved because higher prices for oil imports were more than offset by higher prices for diamond exports. Similar reasoning held for Mozambique because of higher prices for aluminum; in Niger, for uranium; and in Zambia, for copper.

The average current account deficit for oil-importing countries is expected to increase to 4.1% of the GDP in 2006 and to 3.8% of the GDP in 2007. For oil-exporting countries, the surplus is predicted to rise to 15.4% of the GDP in 2006 and 15.8% of the GDP in 2007. Africa was expected to run a current account surplus of 3.6% of the GDP in 2006 and 4.2% of the GDP in 2007.

In 2004 or 2005, mineral fuels accounted for more than 90% of the export earnings of Algeria, Equatorial Guinea, Libya, and Nigeria. Minerals and mineral fuels accounted for more than 80% of the export earnings of Botswana (led by, in order of value, diamond, copper, nickel, soda ash, and gold), Congo (Brazzaville) (petroleum), Congo (Kinshasa) (diamond, petroleum, cobalt, and copper), Gabon (petroleum and manganese), Guinea (bauxite, alumina, gold, and diamond), Sierra Leone (diamond), and Sudan (petroleum and gold). Minerals and mineral fuels accounted for more than 50% of the export earnings of Mali (gold), Mauritania (iron ore), Mozambique (aluminum), Namibia (diamond, uranium, gold, and zinc), and Zambia (copper and cobalt). Gold was a significant source of export earnings in Ghana, South Africa, and Tanzania. Diamond was a significant source of export earnings in the Central African Republic and South Africa, as was uranium in Niger.

Africa's natural gas exporters included Algeria, which had 72% of the continent's natural gas exports, Nigeria, 13%, Egypt, 9%, and Libya, 6%. Europe received 91% of African total natural gas exports and was the destination of 95% of Africa's natural gas exports by pipeline and 88% of Africa's liquefied natural gas (LNG) exports. The United States received 11% of Africa's LNG exports, and countries of the Asia and the Pacific region, 1%.

In 2005, Europe received 35% of Africa's petroleum exports; the United States, 32%; China, 10%; Japan, 2%; and other countries in the Asia and the Pacific region, 12%. West African countries sent 45% of their exports to the United States and 32% to China, Japan, and other countries in the Asia and the Pacific region. North African

countries sent 64% of their exports to Europe and 18% to the United States. Intraregional exports to African countries amounted to only 2% of total African petroleum exports.

Intraregional minerals trade was however significant in the case of gold. South Africa imported 142,000 kilograms per year of gold, mostly from West African countries, to supply its gold refinery. A majority of African gold mine production was refined in South Africa before export to other regions.

Most of Africa's copper and platinum group metals PGM production was exported in refined form. The majority of Africa's chromite production was processed into ferrochromium before export. For other commodities, which included bauxite, colored gemstones, diamond, iron ore, petroleum, and uranium, most of or all the continent's production was exported before downstream processing.

In September 2004, the Eritrean government ordered a halt to all mineral exploration activity in the country while it reviewed its Mining Act. The government suspension was lifted in January 2005. The government increased the maximum possible equity interest that it may hold in a project through an option agreement from 20% to 30%.

Effective February 28, 2005, platinum producers could no longer hold proceeds from Zimbabwean mining activity in foreign accounts to fund exploration and development in that country. The loss of direct access to these earnings may make it more difficult for foreign companies to fund exploration in Zimbabwe.

At the end of 2004, the government of Liberia passed legislation providing for controls on the export, import, and transit of rough diamond. In addition, the government suspended the issuance of all permits for diamond mining and placed a moratorium on alluvial diamond prospecting.

On December 15, 2005, the Parliament of Ghana passed a new Minerals and Mining Law (law number 703). The new law provides for access to mineral rights on a first-come, first-considered basis; a specific time frame within which all applications should be granted; the right for applicants to demand written reasons from the Minister if an application is rejected; the government's right to acquire land or authorize its occupation and use if the land is required for mining purposes; the establishment of a cadastral system for the administration of mineral rights; the

establishment of the permissible range of royalty rates at not less than 3% or more than 6% of total mining revenues; the government's right to obtain a 10% free-carried interest in mining leases; and the establishment of the period of duration of a mining lease, which is not to exceed 30 years and which may be renewed once for a period not to exceed an additional 30 years.

In South Africa, the Government's Black Economic Empowerment program required that black ownership of the mining industry reach 15% by 2009 and 26% by 2014. Recent actions to increase black ownership included the acquisition of 20% of Gold Fields by black-owned Mvelaphanda Resources Ltd. by 2009; the transfer of mines held by AngloGold Ashanti to black-owned African Rainbow Minerals; and the acquisition of 30% of Sallies Ltd. by African Renaissance Investments (Pty) Ltd.

Deforestation for fuel use and land-intensive agricultural production continued to be a significant environmental issue in many African countries. Other causes of deforestation included artisanal production of gemstones, lime, and sand and gravel. The West African Gas Pipeline, which was expected to start regular operations in the end of 2008, could help mitigate the effects of deforestation in Benin, Ghana, and Togo and reduce emissions of greenhouse gases. In 2005 natural gas was being flared by Nigeria; in the future, Nigeria expected to export natural gas to Benin, Ghana, and Togo. The government of Nigeria had committed to ending the flaring of natural gas, which would lead to decreased pollution.

The use of mercury by artisanal gold miners has led to serious air and water pollution in Ghana, Kenya, Mozambique, South Africa, Sudan, Tanzania, and Zimbabwe. The Global Environment Facility, the United Nations Development Programme, and the United Nations Industrial Development Organization began the Global Mercury Project in August 2002 to alleviate these problems. The Global Mercury Project has been providing cleaner technologies and training for miners, conducting health assessments, and helping institute government regulatory capacities.

From 2000 to 2005, African production of refined aluminium increased by 54%. In Mozambique, the Mozal smelter was completed in 2000, and the Mozal 2 smelter, in 2003. South Africa's production increased because of the expansion of the Hillside smelter in December 2003. Output also increased in Cameroon and Egypt. In Ghana, the Valco smelter was shut down because of droughts that reduced the country's effective hydropower capacity. South Africa accounted for about 48% of African aluminium output; Mozambique, 32%; and Egypt, 14%. Kenya was the only African

producer of secondary refined aluminium. Africa accounted for 5% of the world's aluminium production in 2005.

African bauxite production declined by about 3% from 2000 to 2005. From 1990 to 2005, Africa's share of world bauxite production decreased to 9% from 16%. Guinea accounted for about 95% of African bauxite production; Ghana accounted for most of the remainder. In 2005, Guinea was the only African producer of alumina.

In 2005, world aluminium consumption amounted to 31.6 million metric tons (t) compared with 29.9 t in 2004. African consumption of aluminium increased by 3.4% in 2005. In South Africa, aluminium consumption increased to 374,000 t in 2005 from 342,000 t in 2004.

The production of refined aluminium is expected to rise by an average of about 10% per year from 2005 to 2011. The Mozal 3 smelter in Mozambique and the Coega smelter in South Africa are expected to open in mid-2009 and late 2010, respectively. In Cameroon, Alcan Inc. plans to triple production from its smelter by 2010.

Aluminium Smelter Co. of Nigeria Ltd. could reopen its smelter at Ikot Abasi by 2009 and reach full capacity by 2011. In Ghana, Alcoa Inc. plans to increase production at the Valco smelter starting in 2006.

African bauxite production was likely to increase by an average of about 10% per year from 2005 to 2011. In Guinea, planned increases in alumina refining capacity of about 5 million metric tons per year in 2008 and 2009 are expected to lead to higher bauxite production. The Sangarédi and the Kamsar refineries are likely to start production in late 2008 and 2009, respectively, and the expansion of the Friguia refinery could be completed in 2009. The reopening of the Sierra Mineral Holdings bauxite mine in 2006 and the restart of mining in the Kambia District in 2010 could increase Sierra Leone's bauxite production to 2.7 Mt in 2011.

Africa's mine production of copper increased by 48% from 2000 to 2005. Zambia was the leading producer in Africa; the country's increasing production was attributable to higher output from the Mufulira and the Nkana Mines and the reopening of the Chambishi Mine. The production increase in Congo (Kinshasa) was mostly attributable to the opening of the Lonshi Mine and the Dikulushi Mine in 2001 and 2002, respectively. South Africa's output declined because of lower production from the Palabora Mine and the closure of the Maranda Mine in 2004. In 2005, Zambia accounted for 65% of African copper mine production; South Africa, 15%; and Congo

(Kinshasa), 13%. Africa's share of world copper mine production was 5% in 2005 compared with 14% in 1990.

Africa's refined copper production rose by 40% from 2000 to 2005; increased production from the Bwana Mkubwa and the Mufulira plants in Zambia more than offset lower South African output. In South Africa, production declined because of lower output from the Palabora refinery. In 2005, Zambia accounted for 77% of African refined copper production; South Africa, 19%; and Egypt, 3%. Congo (Kinshasa), which accounted for 37% of continental refined copper output in 1990, had ceased production by 2000. Egypt was the only producer of secondary refined copper; primary production accounted for most African production.

In 2005, world refined copper consumption increased to 16.8 Metric tonnes from 16.7 t in 2004; African consumption of copper amounted to about 170,000 t in 2005. South Africa's consumption declined to 82,000 t in 2005 from 84,000 t in 2004.

African copper mine production was expected to rise by an average of about 16% per year from 2005 to 2011. Congo (Kinshasa) could account for about one-half of the increase in output. Nikanor plc planned to open the Kananga and the Tilwezembe mines in 2006 and 2007, respectively, and to restart production at the Kamoto-Oliveira-Virgule (KOV) Mine in late 2009. Central African Mining and Exploration Company plc (CAMEC) was expected to open a new mine during the first quarter of 2008 and to reach full capacity in 2009. Tenke Mining planned to start the Tenke Fungurume project in late 2008. Anvil Mining Ltd. planned to increase production at Kulu in 2006 and to open the Mutoshi Mine in early 2007. Metorex Ltd. is likely to start the Ruashi Tailings project in mid-2006 and the Ruashi Mine in July 2008. Other new sources of production include the Kolwezi Tailings project in 2008 and the Etoile Mine in 2009. The Ruashi Tailings project and the Lonshi Mine were expected to be shut down in 2010.

Output was likely to rise sharply in Zambia because of higher production from the Kansanshi mine in 2006 and the opening of the Chingola and the Lumwana mine in 2007 and 2009, respectively. Expansions are planned for the Mufulira, the Mufulira South, and the Nkana Mines in 2007.

In Botswana, the Dukwe mine was expected to open in 2009 and to reach full capacity by 2011; production from the Phoenix Mine was likely to triple by 2011. Nevsun Resources Ltd. planned to start mining from a copper-rich zone at Bisha in Eritrea in



2010. In Mauritania, the Guelb Moghrein Mine started to produce refined copper in late 2006. South Africa's production could increase because of the expansion of the Limpopo PGM mine.

The production of refined copper was expected to rise by an average of 17% per year from 2005 to 2011. Zambia's production is expected to increase because of higher output from the Mufulira refinery and the Bwana Mkubwa and the Kansanshi solvent extraction-electrowinning (SX-EW) plants in 2006 and the Konkola SX-EW plants by 2007. In Congo (Kinshasa), new SX-EW plants could open at the Kolwezi Tailings project and the Mutoshi Mine in early 2008, and at the KOV Mine in late 2009. CAMEC planned to start production at the Luita plant in 2008. Congo (Kinshasa), which did not produce refined copper in 2000, could account for more than 25% of Africa's refined copper output by 2011.

Africa's gold mine production was 522,000 kilograms in 2005, which was a decrease of 14% compared with that of 2000. Production was considerably less than that of 1990 because of the long-term decline in South African production. From 1990 to 2005, Africa's share of world gold mine production decreased from 32% to about 21%.

In South Africa, the decrease in production since 2000 was broad based, with output declining at the Great Noligwa Mine, the Driefontein, the Kloof mine, the Mponeng, the Savuka Mine, and the TauTona Mines. The Ergo mine, the North West, and the St. Helena Mines have been closed. The decline in Ghana's production was partially attributable to lower output at the Bibiani Mine. Output also decreased in Zimbabwe.

In Tanzania, production increased in recent years because of the opening of the Geita Mine in 2000; the Bulyanhulu Mine in 2001; the North Mara Gold Mine in 2002; the Buhemba Mine in 2003; and the Tulawaka Mine in 2005. Output increased since 2000 in Mali because of the opening of the Loulo, the Morila, and the Yatela Mines. The Mupane and the Samira Hill Gold Mines were opened in Botswana and Niger, respectively; these countries had only artisanal gold production before 2004.

In 2005, South Africa accounted for 56% of African gold production; Ghana, 13%; Tanzania, 10%; and Mali, 8%. South Africa's share of continental gold production continued to decline from 89% in 1990 because of rising production costs associated with deeper underground operations and increased production in Ghana, Guinea, Mali, and Tanzania.

Gold mine production in Africa is expected to increase by 17% from 2005 to 2009. The long-term decline in South Africa's production could be reversed because of the expected completion of the Moab Khotsoeng mine in 2006, the Dominion Mine in 2007, the Tshepong Decline project in 2008, the Phakisa Shaft in 2009, and the planned expansion of the Masimong Mine in 2010. By 2011, these projects could more than offset the shutdown of the Ergo and the North West Mines in 2005, the planned closure of the Crown Mine in 2009, and lower production from the Great Noligwa, the Kopanang, and the Tau Lekoa Mines.

In Ghana, the outlook is for a substantial increase in output because of the expected opening of the Ahafo mine in the second half of 2006 and the Akyem Mine in 2008 and higher production from the Chirano Gold Mine and the Wassa Mines. Output is expected to decline at the Bibiani Mine.

Tanzania's production was likely to rise to 60 t by 2009 with the opening of the Buckreef Mine in 2007 and the Buzwagi Gold Mine in 2008 and the increased capacity at the North Mara Mine; these increases could more than offset the decreased production at the Geita Gold Mine. Production in Tanzania was expected to decline to 56 t by 2011 because of the planned closure of the Tulawaka Gold Mine in 2010. In Mali, the opening of the Tabakoto Mine in 2006 and the reopening of the Syama Mine in 2008 are likely to be offset by the shutdown of the Yatela Mine in 2007 and lower production at the Morila Gold Mine.

Several African countries that had only artisanal gold production in 2005 are likely to open large-scale gold mines in the near future. By January 2008, production was expected to start at the Bonikro gold deposit in Côte d'Ivoire. In Mauritania, Rio Narcea Gold Mines Ltd. plans to start production at the Tasiast Gold Mine by mid-2007. The Youga and the Taparko Mines are expected to open in Burkina Faso by 2007 and 2009, respectively. Gold-rich zones in the Bisha Mine in Eritrea are planned to be mined from 2008 to 2010. In Congo (Kinshasa), the Kilo Moto Mine could open in 2009. Sudan's only large-scale gold mine is expected to shut down in 2010.

African production of crude steel increased by 27% from 2000 to 2005. The majority of the increase was attributable to Egypt. South Africa accounted for 54% of regional crude steel production; Egypt, 32%; Libya, 7%; and Algeria, 6%. Africa's share of world crude steel production amounted to 2% in 2005. South Africa produced about 7.1 t of hot-rolled steel products in 2005, and Libya, 1.67 t. Other African producers of hot-rolled steel products included Algeria, Egypt, Morocco, and Tunisia.

Africa accounted for 2% of the world's finished steel consumption. Africa consumed 18 t of finished steel products in 2005 compared with 17.5 t in 2004 and 15 t in 2000.

Crude steel production was expected to rise by an average of about 5% per year from 2005 to 2011. Nigeria, which accounted for less than 1% of African crude steel output in 2005, could increase its share to 10% by 2011 with the opening of the Ajaokuta plant in 2006 and higher production at the Delta plant. In South Africa, the expansion of the Vanderbijlpark plant was scheduled to take place from 2006 to 2009. In Algeria, increased use of existing capacity was expected to raise national steel production to 2.5 t by 2011. Production could increase in Zimbabwe as Zimbabwe Iron and Steel Company restores its capacity; improvement in this company's situation depends upon the restoration of economic and political stability. African consumption of finished steel is expected to rise to 19 t by 2008.

In 2005, the iron content of ore produced in Africa amounted to 34.8 t compared with 32.1 t in 2000. Higher production from the Sishen and the Thabazimbi Mines in South Africa more than offset lower output in Egypt and Mauritania. South Africa was the leading iron ore producer in Africa and accounted for 72% of continental output; Mauritania, 21%; and Egypt, 5%.

The iron content of ore produced in Africa is expected to increase to almost 62 t in 2011. In South Africa, the expansion of the Sishen Mine is likely to be completed in 2009; a further expansion of the mine could be completed by 2011. Production at the Bruce, the King, and the Mokaning Mines (BKM) could start in 2008; a proposed expansion of the mines could be completed in 2010. The opening of BKM would more than offset the expected decline in output from the Beeshok Mine after 2008. The F Faleme iron ore project in Senegal could start production in 2011. In Nigeria, mining is expected to restart at the Ajaybanko and the I Itakpe iron ore deposits in 2006 or 2007 and to reach full production by 2009. Output was also expected to increase in Algeria.

From 2000 to 2005, African lead mine production decreased by nearly 39%. South Africa's production declined because of lower production at the Black Mountain Mine and the closure of the Pering Mine in 2003. The decrease in Morocco's output was attributable to the closure of the Touissit Mine in 2002 and technical problems experienced by Compagnie Minière de Guemassa. In Tunisia, the Bouhabeur and the Fej Lahdoum Mines were closed in 2004, and the Bougrine Mine, in 2005. In Namibia, output increased at the Rosh Pinah mine. In 2005, Morocco and South

Africa accounted for 39% each of African lead mine production, and Namibia, 13%. Africa's share of the world's lead mine production was about 3% in 2005.

African production of primary refined lead declined by 45% compared with that of 2000; the decrease may have been attributable to lower lead mine production in Morocco. Production also declined in Algeria. Morocco, which was the leading African producer of primary refined lead, accounted for 88% of continental output. From 2000 to 2005, Africa's production of secondary refined lead increased by 34%. South Africa accounted for 86% of African secondary refined lead output; Kenya, Morocco, and Nigeria accounted for the remainder. The share of primary lead in total refined lead production in Africa declined to 35% in 2005 from 64% in 1995 and 72% in 1990.

In 2004, world refined lead consumption was about 7.08 t compared with 6.8 Mt in 2003. South African lead consumption increased to 80,700 t in 2004 from 78,700 t in 2003.

The decline in African lead mine production is likely to continue, with output expected to decline by 22% from 2005 to 2011. Most of the decrease would be attributable to the closure of the Bougrine Mine in Tunisia in 2005 and the Rosh Pinah Mine in Namibia by 2010. Secondary refined lead production is expected to increase in South Africa in 2006.

African mine production of nickel increased by nearly 9% from 2000 to 2005. South Africa accounted for most of the increase in production; output also increased in Botswana and Zimbabwe. The majority of South Africa's nickel output was a coproduct of platinum metals group mining. Higher South African production was partially attributable to increased output from the Nkomati mine. In 2005, South Africa accounted for 47% of African nickel mine output; Botswana, 43%; and Zimbabwe, 9%. Minor tonnages of nickel were recovered as a byproduct of cobalt operations in Morocco.

In 2004, South Africa's consumption of nickel increased to 25,000 t from 24,000 t in 2003. The stainless steel industry accounted for most of South Africa's nickel demand.

Nickel mine production is likely to double from 2005 to 2011. The startup of the Ambatovy nickel and cobalt mine in 2009 in Madagascar is expected to account for the majority of the increase. Madagascar, which did not mine nickel in 2005, could have a 33% share of African nickel mine production by 2011. South Africa's output is

expected to nearly double by 2011 because of increased capacity at the Nkomati nickel mine and the Limpopo and the Marikana PGM mines. In Zambia, Albidon Ltd. planned to start production from the Munali project in 2008. Production could increase at the Mimosa PGM mine in Zimbabwe. Botswana's production is likely to decline because of the closure of the Selebi-Phikwe mine in 2011 or 2012.

From 2000 to 2005, Africa's production of palladium and platinum increased by 55% and 47%, respectively. South African production increased because of higher output from the Bafokeng mine, the Impala mine, the Kroondal mine, the Marikana, and the Rustenburg Mines, and the opening of the Modikwa mine in 2002. Production increased in Zimbabwe because of higher output from the Mimosa mine and the opening of the Ngezi mine in 2001. South Africa, which was the continent's dominant producer of platinum group metals (PGM) in Africa, accounted for 97% and 96% of the production of platinum and palladium, respectively.

African mine production of palladium is expected to increase by an average of between 4% and 5% per year from 2005 to 2011, and platinum, by between 3% and 4% per year. In South Africa, the increase is likely to be attributable to the opening of the Mototolo mine in late 2006 and the Two Rivers mine in 2007; the expansions of the Marula mine in 2007 and 2009, the Limpopo Mine in 2007 and 2010, the Rustenburg Mine in 2008, and the Nkomati mine by the end of 2009; and higher production from the Everest, the Kroondal, the Marikana, and the Modikwa Mines. Higher output in Zimbabwe is likely to result from the expansion of the Mimosa and the Ngezi Mines and the opening of the Unki mine in 2009.

From 2000 to 2005, Africa's mine production of zinc declined by about 17%. The decrease in Morocco's output was attributable to technical problems experienced by Compagnie Minière de Guemassa. In South Africa, the closure of the Pering mine in 2003 and the Maranda Mine in 2004 more than offset higher output from the Black Mountain Mine. In Tunisia, the Bouhabeur and the Fej Lahdoum Mines were closed in 2004, and the Bougrine Mine, in 2005. Algerian output declined because of the shutdown of El Abed and the Kherzet Youcef Mines. Namibia's production increased because of the opening of the Skorpion Zinc mine; production also restarted at Slag Treatment Plant Lubumbashi in Congo (Kinshasa). In 2005, Morocco accounted for 36% of African zinc mine production; Namibia, 32%; South Africa, 15%; and Tunisia, 7%. Africa's share of world zinc mine production was about 2% in 2005. African production of zinc metal increased by 85% compared with that of 2000. In

Namibia, the Skorpion smelter was opened in 2003. Production declined in Algeria and South Africa. Namibia, which did not produce zinc metal before 2003, accounted for 48% of continental zinc metal production in 2005. South Africa's share declined to 40% in 2005 from 75% in 2000, and Algeria's share, to 12% from 25%.

In 2005, world refined zinc consumption remained nearly unchanged at about 10.3 Mt. South African zinc consumption increased to 103,000 t in 2005 from 91,000 t in 2004.

The decline in African zinc mine production was likely to continue, with output declining by 13% from 2005 to 2011. Most of the decrease would be attributable to the closure of the Bougrine Mine in Tunisia in 2005 and the Rosh Pinah mine in Namibia by 2010. In Congo (Kinshasa), the proposed reopening of the Kipushi Mine and the reprocessing of zinc and germanium tailings near Kolwezi could lead to further increases in production, but whether these projects will be implemented by the end of 2011 is uncertain. Higher production from the Skorpion smelter in Namibia could increase regional production of zinc metal by nearly 8% by 2007. This increase would more than offset the decreased output expected from the Zincor Mine in South Africa.

In 2005, Africa's share of world diamond production, by volume, was 46%. African diamond production increased by nearly 51% in 2005 compared with that of 2000. The increase in output was broadly based, with production rising in Angola, Botswana, Congo (Kinshasa), Ghana, Guinea, Lesotho, Namibia, Sierra Leone, South Africa, and Zimbabwe. Production declined in the Central African Republic and Tanzania.

Congo (Kinshasa) accounted for nearly one-half of the increase in production, by volume. Increased political stability and the Kimberley Process led to higher production by artisanal miners. Société Minière de Bakwanga (MIBA) increased its output. In addition, Sengamines and Midamines SPRL started mining operations in 2001 and 2005, respectively.

In Botswana, production increased at the Jwaneng diamond mine, the Letlhakane diamond mine, and the Orapa diamond mine, and the Damtshaa diamond mine opened. In South Africa, production increased at the Finsch diamond mine, the Kimberley diamond mine, the Namaqualand, and the Venetia Diamond Mine. In Namibia, higher production was attributable to Namdeb Diamond Corporation (Pty)

Ltd and Jk minerals Africa's increased output. The Murowa diamond mine commenced production in Zimbabwe in 2004. Botswana accounted for 35% of African diamond output by volume; Congo (Kinshasa), 34%; South Africa, 17%; and Angola, 8%.

In 2005, the global value of rough diamond production amounted to \$12.7 billion, of which Africa accounted for about 60%. Botswana accounted for 24% of the value of global rough diamond output; South Africa, 12%; Angola, 11%; Congo (Kinshasa), 8%; and Namibia, 5%.

In November 2002, the Kimberley Process Certification Scheme was established to reduce the trade of conflict diamonds, particularly diamonds originating from Angola, Congo (Kinshasa), and Sierra Leone. The establishment of the Kimberley Process involved officials from more than 50 countries that produced, processed, and imported diamond as well as representatives from the European Union, the World Diamond Council, the African Diamond Council and nongovernmental organizations. As of 2005, the following African countries had met the minimum requirements of the Kimberley Process Certification Scheme: Angola, Botswana, Central African Republic, Congo (Kinshasa), Côte d'Ivoire, Guinea, Lesotho, Mauritius, Namibia, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, and Zimbabwe.

Illicit diamond production controlled by the Kimberley Process focused on Côte d'Ivoire and Liberia in 2005. At the Kimberley Process plenary session held in Moscow in November, the Chair called for action to be taken to help provide technical assistance to countries neighboring Côte d'Ivoire to strengthen controls on diamond trade.

The production of rough diamond is expected to increase by an average of nearly 3% per year from 2005 to 2011. In Angola, the Fucauma Diamond Mine, the Kamachia-Kamajiku, the Luarica diamond mine, and the Rio Lapi Garimpo Mines are expected to contribute to higher output. Production could rise in Congo (Kinshasa) because of the possible expansion of MIBA's facilities by 2010. European Diamonds plc started production in Lesotho in 2005; the company planned to reach full capacity in 2006. Zimbabwe's production could increase because of higher production from Murowa diamond mine. Output was expected to rise in Namibia and Tanzania because of expansions at mines operated by DeBeers Group.

African coal production increased by 9% from 2000 to 2005; most of the increase was attributable to South Africa. The Goedgevonden mine, the Mafube, and the Isibonelo Mines opened in 2003, 2004, and 2005, respectively, and production increased at a number of other mines. Output also increased in Botswana, Egypt, Malawi, Niger, Swaziland, and Zambia and decreased in Morocco and Zimbabwe. South Africa, which was the dominant coal producer in Africa, accounted for 98% of regional coal output; Zimbabwe, 1%; and others, less than 1%. More than 99% of South Africa's coal production was bituminous coal. Africa accounted for about 5% of total world anthracite and bituminous coal production in 2005.

Africa accounted for about 3% of world coal consumption in 2005. Within the region, South Africa accounted for 92% of African coal consumption. Nearly 71% of South Africa's coal production was consumed domestically. From 2000 to 2005, Africa's consumption of coal increased by about 12%.

African coal production is expected to increase by an average of 3% per year from 2005 to 2011. South Africa is likely to be responsible for the majority of the increase; its production could increase to 276 Mt by 2011. Higher output would be attributable to the opening of the Kriel South Mine in 2005, the Forzando South Mine in 2006, the Mooikraal Mine in mid-2007, and the Inyanda Mine in 2008; and the expansions of the Goedgevonden and the Leeuwpan coal mine in 2006, the Syferfontein Mine in 2007, the Mafube Mine in 2008, and the Grootegeeluk Mine in 2010. Mozambique is expected to become the second-ranked coal producer in Africa with the development of the Moatize Project in 2010. Botswana is likely to become the third-ranked producer because of the expansion of the Morupule Colliery in 2008 and the start of production at the Mmamabula project in 2011. In Zimbabwe, output could increase at Hwange Colliery by 2011 if economic and political stability are restored. Production is also expected to rise in Malawi, Nigeria, and Tanzania.

In 2005, African uranium mine production increased by 7% compared to 2000. Most of the increase was attributable to higher production at the Rossing uranium mine in Namibia; Niger's output also increased. South Africa's production declined because of lower gold mine output. Namibia accounted for 46% of African uranium production; Niger, 44%; and South Africa, less than 10%. In 1990, Niger's and South Africa's shares of continental production were 30% and 27%, respectively. Africa accounted for about 16% of the world's uranium production in 2005.



South Africa was the only regional consumer of uranium in 2005. Africa accounted for less than 1% of the electricity generated worldwide by nuclear power.

Continental uranium mine production is expected to rise by 10% per year from 2005 to 2011. Namibia's uranium production is likely to increase substantially with the opening of the Langer Heinrich mine in late 2006 and its planned expansion, which could be completed by 2010 or 2011. In South Africa, the Dominion mine is expected to open in 2007 and to produce more than 1,800 t/yr of uranium oxide (U<sub>3</sub>O<sub>8</sub>) in 2010. AngloGold Ashanti Ltd. plans to increase uranium production from its South African gold mines by 40% by 2009. Paladin Energy of Australia plans to produce about 1,500 t/yr of U<sub>3</sub>O<sub>8</sub> from the Kayelekera Project in Malawi starting in the third quarter of 2008.

Both China and Africa proclaim a new, mutually beneficial economic, political, and regional alliance. China sees a source for raw materials and energy, desperately needed to support its feverish industrial and economic growth. Success in this quest means high employment and a higher quality of life for Chinese citizens, as well as increasing social stability and political security for Chinese elites.

Chinese oil companies are gaining the invaluable experience of working in African nations which will prepare them for larger projects on the far more competitive world market. The efficiency of Chinese assistance, loans, and proposals generally been praised. Finally, Chinese industry has found in Africa a budding market for its low-cost manufactured goods.

Chinese diaspora in Africa have been actively supported by Chinese embassies, continuously building the 'Blood Brother' relation between China and Africa as perceived victims of Western imperialism.

African leaders earn legitimacy through Chinese partnerships. They work together with the Chinese to provide Africa with key structural infrastructure—roads, railways, ports, hydroelectric dams, and refineries—fundamentals which will help Africa avoid the "resource curse". Success in this endeavor means avoiding the exploitation of their natural wealth and the beginning of fundamental social and economic transformations on the continent.

African countries partnering with China today are signing with a future world superpower. In Africa, this Chinese alliance provides strong psychological consequences. It provides economic hope and shows African elites an example of success which they may take as exemplars of their own future. Writer Harry Broadman commented that if Chinese investments in key sectors of infrastructure, telecommunication, manufacturing, foods, and textiles radically alter the African continent, the main change will have taken place in African minds. With the recent growth and economic improvement, more Africans students are returning to Africa after studies abroad in order to bring their skills and industry home.

After the formation of the People's Republic of China following the Communist party victory in 1949, some Chinese fled, eventually landing in Africa. By the 1950s, Chinese communities in excess of 100,000 existed in South Africa, Madagascar, and Mauritius. Small Chinese communities in other parts of Africa later became the cornerstone of the post-1980 growth in dealings between China and Africa. However, at the time, many lived lives centered on local agriculture and probably had little or no contact with China. Precise statistics of the Chinese presence in Africa are difficult to obtain, since both Chinese and African offices have remained discreet about this issue.

The newly formed People's Republic of China actively began supporting the decolonization movements in Africa and the Pacific. This era is especially important in the "Sino-African friendship" movement, as both the PRC and many of the decolonized African nations shared a "victim background", the perception that they were both taken advantage of by imperialistic nations such as Japan and European states.

The growing Sino-Soviet split of the 1950s and 1960s allowed the PRC to get US support, and to return to the international scene in 1971. China (Taiwan)'s seat on the Security Council was expelled by General Assembly Resolution 2758, and replaced in all UN organs with the People's Republic of China.

With growing opposition between the USSR and the PRC in the 1960s, China expanded its own program of diplomacy, sometimes supporting capitalist factions against USSR backed ones (e.g. Angola (UNITA) and South Africa).

At the 1955 Bandung conference, China showed an interest in becoming the leader of the "third world". Zhou Enlai made an extensive African tour between 1963 and 1964, to strengthen Sino-African friendship. Hundreds of Chinese medics were sent to

Africa and infrastructural projects were planned. The iconic 1860 km Tanzam railroad, built by 50.000 Chinese workers, was completed in 1976. Ex-diplomat and now professor of Foreign Relations in Beijing, M. Xinghua, referred to this era as the "golden age" of Sino-African relations. Growing numbers of African countries switched their recognition from the ROC (Taiwan) to the PRC. 1976 marked the death of Zhou Enlai and Mao Zedong, bringing the era of ideology symbolically to a close and leaving power in the pragmatic hands of Deng Xiaoping.

The shift to a less ideological approach was not without difficulty, and it involved considerable political effort to maintain the perception of a coherent national direction. Writer Philip Snow describes it thus: "a continual attempt to sustain a rhetorical unity which has sometimes disguised the pursuit of profoundly different goals".

Chinese world trade has grown rapidly over the last decades. Total trade was roughly \$100 US billion in 1990, 500 billion in 2000, 850 billion in 2004, 1400 billion in 2005, and 2200 billion in 2007. That computes to an over 20-fold increase in under 20 years and an annualized growth rate of nearly 18%. More remarkably, the vast majority of China's growth has taken place in the past decade; in other words, not only is the size of China's trade growing, the rate of the growth is accelerating. Thanks to the decades-old Chinese diaspora, the economic dynamism of PRC embassies, China's low-cost manufacturing industry, an efficient export engine, and an exchange rate that until 2010 has been held deliberately low, China's global trade has thrived.

In context of China's total trade, Africa actually comprises only a small part. In 2007, Sino-African trade rose \$73b, 3.4% of China's \$2173b total, far lower than the EU (\$356b, 16.4%), the USA (\$302b, 13.9%), and Japan (\$236b, 10.9%).

China is Africa's first trading partner since it surpassed the United States in 2009.

The Chinese diaspora first reactivated its familial links in order to import low-priced goods such as cups, forks, cellular phone, radio, television sets and umbrellas to Africa. Indeed, African society has a screaming need for cheap goods in large quantities. China's manufacturing industry is truly complementary to African markets, often producing more cheaply than most African manufacturers can, and with better quality. Cheap Chinese clothes, and cheap Chinese cars at half the price of western ones allow African customers to suddenly raise up the purchasing power.

In Africa, China may sell its own low quality or overproduced goods and inventory, a key outlet which helps maintain China's economic and social stability. Chinese shop-owners in Africa are able to sell Chinese-built, Chinese-shipped goods for a profit. A negative consequence of China's low-cost consumer goods trade is that it only goes one way. China does not purchase manufactured products from Africa, while cheap Chinese imports flood the local marketplace, making it difficult for local industries to compete.

A noticeable case is the Chinese textile industry, which has hit Africa like a tsunami. In many countries, textiles are one of the first manufacturing industries to develop, but the African textile industry has been crippled by competition. The negative consequences are not easily resolved: African consumers give praise to Chinese textiles, and they are often the first clothes they can afford to buy new; yet local manufactures are badly wounded, raising opposition and concern over the loss of local jobs.

Africa is seen by Chinese businessmen as 900 million potential customers in a fast-growing market,. Perhaps more importantly, African societies are far from market saturation, like their Western counterparts. Thus, in Africa, China finds not only an ample supply of potential new customers but far less competition from other nations.

A few examples of the products imported by China in African countries in 2014 : Benin bought \$411m worth of wigs and fake bears from China, 88% of South Africa's imported male underpants were from China, Mauritius spent \$438,929 on Chinese soy sauce, Kenya spent \$8,197,499 on plastic toilet seats, Nigeria spent \$9,372,920 on Chinese toothbrushes, Togo bought \$193,818,756 worth of Chinese motorbikes and Nigeria \$450,012,993.

In the other direction, China's growing thirst for raw materials led Chinese state-owned enterprises to the country with natural resources, such as wood and minerals (like those from the Gabonese forests). By the end of the 1990s, China had become interested in African oil, too.

Over time, African laws adapted to China's demand, laws intended to force the local transformation of raw materials for export. This led to a new kind of manufacturing in Africa, managed by the Chinese, with African workers producing exports for Chinese, as well as European, American and Japanese customers. African leaders have pursued

an increase of the share of raw material transformation both to add value to their exports and to provide manufacturing jobs for local Africans.

China's oil purchases have raised oil prices, boosting the government revenues of oil exporters like Angola, Gabon and Nigeria, while hurting the other oil-importing African countries. At the same time, China's raw materials purchases have increased prices for copper, timber, and nickel, which benefits many African countries as well.

While African growth from 2000 to 2005 averaged 4.7% per year, almost twice the growth has come from petroleum-exporting countries (2005: 7.4%; 2006: 6.7%; 2007: 9.1%) than from petroleum-importing countries (2005: 4.5%; 2006: 4.8%; 2007: 4.5%).

During the year 2011, trade between Africa and China increased a staggering 33% from the previous year to US \$166 billion. This included Chinese imports from Africa equalling US \$93 billion, consisting largely of mineral ores, petroleum, and agricultural products and Chinese exports to Africa totalling \$93 billion, consisting largely of manufactured goods. Outlining the rapidly expanding trade between the African continent and China, trade between these two areas of the world increased further by over 22% year-over-year to US \$80.5 billion during the first five months of the year 2012. Imports from Africa were up 25.5% to \$49.6 billion during these first five months of 2012 and exports of Chinese-made products, such as machinery, electrical and consumer goods and clothing/footwear increased 17.5% to reach \$30.9 billion. China remained Africa's largest trading partner during 2011 for the fourth consecutive year (starting in 2008). To put the entire trade between China and Africa into perspective, during the early 1960s trade between these two large parts of the world were in the mere hundreds of millions of dollars back then. Europe dominated African trade during these formative years of European decolonization process in the African continent. Even as early as the 1980s, trade between China and Africa was minuscule. Trade between China and Africa largely grew exponentially following China's joining of the World Trade Organization (WTO) and the opening up of China to emigration (of Chinese people to Africa) and the free movement of companies, peoples, and products both to and from the African continent starting from the early 2000 onwards.

For years, business in Africa was hampered by poor transportation between countries and regions. Chinese-African associations have worked towards ending this unproductive situation. China provides infrastructure funding and workforce in

exchange for immediate preferential relations including lower resource prices or shares of African resources. As a secondary effect, this infrastructure allows Africa to increase its production and exports, improve the quality of life and increase the condition of millions of Africans, who will one day become as many millions of potential buyers of Chinese goods.

The recent Sino-Angolan association is illustrative. When a petroleum-rich area called for investment and rebuilding, China advanced a \$5 billion loan to be repaid in oil. They sent Chinese technicians, fixing a large part of the electrical system, and leading a part of the reconstruction. In the short term Angola benefits from Chinese-built roads, hospitals, schools, hotels, football stadiums, shopping centers and telecommunications projects. In turn, Angola mortgaged future oil production of a valuable, non-renewable resource. It may turn out to be a costly trade for Angola, but their needs for infrastructure is immediate and that is precisely what China provided when no one else is willing to do so. And thusly, Angola has become China's leading energy supplier.

China also plan to establish five special economic zones in Africa, zones where "the Chinese government will create the enabling environment into which Chinese companies can follow".

The Exim Bank of China (Eximbank) is a government bank under direct leadership of the State Council, acting both in China and overseas. For its oversea actions, EximBank has hundreds of offices across the world, with three key representatives in Paris, St. Petersburg, and Johannesburg. The bank is a major force in Chinese foreign trade, aiming to catalyze import-export initiatives.

Eximbank offers enterprises and allies a complete set of financial products. Low-rate loans and associations with skilled Chinese building companies are guided towards building or rebuilding local infrastructure, equipment, and offshore stations which meet a dual Chinese and African interest. EximBank can provide loans for roads, railroads, electric and telecommunication systems, pipelines, hospitals and various other needed facilities. It is the sole lending bank for Chinese Government Concessional Loans entrusted by the Chinese Government.

The bank officially aims to promote the development of Chinese export-oriented economy, to help provide China with raw materials, and facilitate the selling of Chinese goods abroad . EximBank helps to invest in underdeveloped African

countries, allowing them to both produce and export more raw materials to Chinese industries, and to allowing African societies to expand their own markets. In 2006, EximBank alone pledged \$20 billion in development funds for 2007 through 2010, more than all western funding. Several other Chinese bank also provide African governments and enterprises with similar agreements. China has shown itself to be more competitive, less bureaucratic, and better adapted to doing business in Africa. Between 2009 and 2010 China Development Bank (CDB) and Eximbank publicly offered around US\$110 bn worth of loans to emerging markets. Beating the World Bank's record of offering just over US\$100 bn between 2008 and 2010.

As a result of Soviet technology-sharing through the mid-1960s and internal reserves such the Daqing oil field, the PRC became oil sufficient in 1963. Chinese ideology and the US-led embargo, however, isolated the Chinese oil industry from 1950 to 1970 preventing their evolution into powerful multinational companies. Chinese oil exports peaked in 1985, but rapid post-Communist economic reforms and an internal increase in oil demand brought China into an oil deficit, becoming a net oil importer in 1993, and a net crude importer in 1996, a trend which is accelerating. Indeed, Chinese reserves, such as the Tarim basin, have proven both difficult to extract and difficult to transport toward Chinese coastal provinces where energy demand is centered. Pipeline construction, as well as processing facilities, lag behind demand.

Through the end of the 20th century, China has been working to establish long-term energy security. Achieving this goal has required investment in oil and gas fields abroad, diversifying energy resource providers, and incorporating non-traditional energy sources like nuclear, solar and other renewables.

The rapid expansion of overseas activities by China's energy companies has been driven by the needs of both government and the PRC's National Oil Companies (NOC), which have worked in an uncommonly close partnership to increase overseas production of oil and gas. Together, they gained access to projects of strategic importance in African nations like Sudan and Nigeria in the 1990s, while leaving smaller opportunities to the companies alone.

Chinese actions in these areas have not always been successful: The 2006 agreement in Rwanda proved unproductive, while Guinean oil technologies were not familiar to Chinese companies. Chinese oil companies produced 257,000 bd in Africa in 2005—just one third of the leader ExxonMobil alone—and just 2% of Africa's total oil reserves.

Moreover, China's arrival on the world oil scene has been perturbing for established players. China has been attacked for its increasingly close relationship with rogue states, such as Sudan and Angola, countries known for their human rights abuses, political censorship, and widespread corruption. China's world image has suffered from the critiques, leading the nation to move to a more diplomatic approach, avoiding crisis areas, such the Niger Delta. Nevertheless, as a consumer country and budding powerhouse, China has little choice in choosing its source of supply.

Chinese access to international oil markets has satisfied the country's immediate thirst. But despite its large coal-based energy system, China is a key part of the vicious cycle which had led to increasing oil prices worldwide—to the disadvantage of all industrialized and oil importing countries, including China itself. In 2006, China imported 47% of its total oil consumption (145 Mt of crude oil). With such high demand, Chinese companies such as Sinopec, CNPC, and CNOOC, have looked to Africa for oil.

Africa is the 2nd largest continent in the world, with 30 million square kilometers of land, and contains a vast quantity of natural resources. This trait, together with the continent's relatively low population density and small manufacturing sector has made Africa a key target for Chinese imports.

Africa ranks first or second in abundance globally for the following minerals: bauxite, cobalt, diamonds, phosphate rocks, platinum group metals, vermiculite, and zirconium. Many other minerals are also present in high quantities.

Many African countries are highly dependent on such exports. Mineral fuels (coal, petroleum) account for more than 90% of the export earnings for: Algeria, Equatorial Guinea, Libya, and Nigeria. Various Minerals account for 80% for Botswana (led by, in order of value, diamond, copper, nickel, soda ash, and gold), Congo (petroleum), Congo (diamond, petroleum, cobalt, and copper), Gabon (petroleum and manganese), Guinea (bauxite, alumina, gold, and diamond), Sierra Leone (diamond), and Sudan (petroleum and gold). Minerals and mineral fuels accounted for more than 50% of the export earnings of Mali (gold), Mauritania (iron ore), Mozambique (aluminum), Namibia (diamond, uranium, gold, and zinc), and Zambia (copper and cobalt).

Ongoing mining projects of more than \$1 billion are taking place in South Africa (platinum, gold), Guinea (bauxite, aluminum), Madagascar (nickel), Mozambique



(coal), Congo and Zambia (cobalt, copper), Nigeria and Sudan (crude petroleum), and Senegal (iron).

China, once in need of international recognition and now in need of raw materials, has walked carefully and humbly towards Africa. The dynamic evolved into what is now called the "Beijing Consensus", China's "soft" diplomatic policy, entailing a strict respect for African sovereignty and a hands-off approach to internal issues. In short: loans and infrastructure without any political strings about democracy, transparency, or human rights attached.

China's 'non-interference' model gives African leaders more freedom and the opportunity to work for immediate economic development. With China, controversial African leaders face a second or third chance to join in international partnerships this time with a successful third world nation; many of the excuses about Western domination which had previously been used to justify Africa's lack of growth can no longer be made.

To the West, China's approach threatens the promotion of democracy, transparency, liberalism and free trade, engaging instead with authoritarianism, economic development at the expense of civil progress, and strengthened ties between political and economic elites over of broad social change. To China, who regards the West's 'human rights discourse' as blatantly hypocritical, their involvement with so-called rogue states increases long term stability and much needed "win-win" social and economic development.

The arrival of a new actor in Africa has led Westerners to review their own strategies as they analyze Chinese actions in Africa. The Western responses may ultimately aid Africa, as think tanks provide strategic analysis on how African elites can get squeeze more out of Chinese investments.

Indeed, it's clearly in the interest of Africa to play one side against the other, and to avoid alliances between China and the West, which might work to decrease raw material prices. Legal power remains in the hands of local African elites, who may or may not decide to enforce laws which would tighten control of resources, or further exploit them. Pursuing democracy and transparency is no longer the sole model; development is, for sure, and as long as African leaders can provide it, their power will be that much assured.

The Republic of China (ROC), commonly known as Taiwan, is a fierce diplomatic rival of the People's Republic of China. Following the Chinese Civil War, both claimed to be the legitimate representative of 'China' on the world scene. At that time, the USSR supported the PRC, while the United States backed ROC, which thus held the Chinese UN security council's seat along with its high visibility and veto power. In 1971, after a complex struggle, the Sino-Soviet split of the 1960s led the United States to offer the UN security council seat to the PRC, thus excluding ROC-Taiwan from the diplomatic scene.

Many countries followed the US move. Yet Taiwan's strengthening economy in the 1970s and 1980s allowed the country to keep some strongholds across the world, which supported ROC's diplomatic claim to the UN. As the PRC grew in power, Taiwan was only able to keep smaller supporters, mainly in the Pacific islands, Latin America, and Africa.

In the 1990s, the political power-play between Taiwan and China often spurred investment in Africa, with a number of large-scale projects seeking to garner influence and recognition.

Nowadays, the balance of power in terms of African friendship seems to be in favour of the PRC. Taiwanese investments in Africa are about \$500 million a year, while Chinese Eximbank alone is approaching \$20 billion over 3 years.

Several Senegalese projects were funded by Taiwan in May 2005, as part of a 5-year plan including \$120 million. But soon after the bank transfer was completed, Senegal moved to support the PRC, and a "development based on free market and fair bids". Abdoulaye Wade, the president of Senegal also wrote to the ROC's president, saying, "Between countries, there is not friendship, just interests."

The last oil producer allied to Taiwan was Chad. But in April 2006, a PRC-Sudan backed coup d'état attempt came close to overthrowing the pro-Taiwanese leader, Idriss Deby. The effort was eventually stopped by French military intervention. Deby first looked for Taiwanese loans to enhance its military strength. Taiwan was unable to provide the \$2 billion which had been requested, and Deby switched to recognising the PRC, thus weakening the coup and strengthening himself. Today, four countries in Africa recognize ROC-Taiwan.

Key reasons of China's interest on Africa are to be found in China itself. Chinese economy, industry, energy and society have a special shape. Chinese economy and industry turn toward export markets. These industries and associated works and investment provide the Chinese society the recent two-digit yearly economic growth, job chances, and life standard improvement, but dramatically rely on coal (70%) and oil (25%) sources (for 2003), as well as raw materials. Notable are the frequent electric shortages. A US Congress hearing noticed that energy shortages have already led to rationing of the electric supply, slowing down manufacturing sector and consequently overall economic growth. On other raw materials side, China simply does not have enough natural resources of its own to meet its growing industrial need.

Within the China economic success story, western scholars noticed that China's quest of wealth has once more led coastal provinces to quickly enrich, while inland provinces or rural areas stay relatively poor, an inequality which thus leads to internal social tensions and instability. Recent economic growth helped to stabilize the Chinese society: in times of economic growth, individuals look simply for personal life improvement. Millions of poor farmers and workers work hard and silently in hope of a better lives tomorrow; they want to buy TVs, computers, cellphones, cars, fridges. To keep them happy and stable, China have to stay largely supplied in raw materials - oil, copper, zinc, cobalt - from abroad. Also, driven by this politico-economic desire to obtain sources of raw materials and energy for China's continuing economic growth and open up new export markets, China is actively looking for African resources of every kind: oil, cobalt, copper, bauxite, uranium, aluminium, manganese, iron ore etc. African resources feed Chinese industries' hunger for minerals and electricity, fuel its economic boom, and thus keep the country's consumers happy and quiet.

For the Communist Party, enough supply of minerals means social stability. Like other power, China needs to supply its industry with raw materials, and its citizen in goods to keep them happy. Out of energy and raw materials shortage, analysts also notice that long-term factors threatening China's growth questions over its innovation capability, corruption and inefficiency, and environmental risks.

## Biggest African companies

### Attijariwafa Bank

Based in Casablanca, Attijariwafa Bank is the largest provider of financial services in Morocco. The banking house operates in 14 countries in the North, West and Central Africa and is a subsidiary of SNI Holdings, King Mohammed VI's investment Plc. Attijariwafa Bank reported a revenue income of \$3.33bn in 2017, according to Forbes. The bank recently partnered with Ghana Commercial Bank (GCB Ltd) and “will operate as correspondent banks, facilitate trade finance, deepen capital markets and jointly organise business missions designed to enhance trade and investment between Morocco and Ghana”, according to Ghanaweb.

### MMI Holdings

South African company MMI Holdings provides short and long-term insurance, asset management, savings, investment, healthcare administration health risk management, employee benefits, property management and rewards programmes, according to Forbes. The company reported a net revenue of \$3.67bn in 2017. MMI formed as the result of a merger between Momentum and Metropolitan in 2010. In the wake of CEO Nicolaas Kruger's resignation in January 2018, deputy CEO Mary Vilakazi maintains her focus is “to extract additional value by operationally integrating the group's two retail operations (Momentum and Metropolitan)”, which generate 60% of MMI's profits.

### Sanlan

Headquartered in Belleville, South Africa, insurance and finance company Sanlan achieved an annual revenue of \$5.81bn last year. The company provides financial

solutions, including “individual, group and short-term insurance, personal financial services such as estate planning, trusts, wills, personal loans, health management, savings and linked products”, according to Forbes. Sanlam experienced a \$137mn profit reduction, although overall revenue increased by over \$400mn. Despite overall asset reduction, Sanlam moved in September 2017 to acquire Lion Assurance Company, a Ugandan insurance company, in a deal worth \$5.6mn.

## Naspers

Television, print media, internet service provider, tech, and publishing company Naspers is based in Cape Town, South Africa and reported a net revenue of \$5.93bn in the last financial year. Over the past three years the Johannesburg Stock Exchange has listed Naspers as the world’s third-fastest growing technology stock, behind Tencent and Nvidia, Moneyweb reports: “An investment in Naspers five years ago would have elicited a 581.8% return, a better return than offered by US technology giants such as Facebook, Amazon.com and Google parent Alphabet.” Naspers CEO Bob Van Dijk announced in November 2017 that they would be pouring billions of unassigned dollars into new ecommerce opportunities in a bid to become a better investment opportunity than Chinese tech giant Tencent: “We have room to invest in the future,” he said.

## FirstRand

Johannesburg-based banking house FirstRand reported a net revenue of \$8.39bn in 2017, according to Forbes. The company provides “banking, insurance and investment products and services to retail, commercial, corporate and public-sector customers through its subsidiaries” Rand Merchant Bank and Wesbank. In November 2017, FirstRand completed a deal to buy UK banking house Aldermore outright for \$1.54bn. The Financial Times reported: “For FirstRand, acquiring Aldermore would enable it to diversify its earnings and mitigate economic weakness and brewing political risk in its domestic market.”

## Standard Bank Group

Regional banking conglomerate Standard Bank Group operates out of Johannesburg, South Africa, through four subsidiary banking units: Personal & Business, Corporate & Investment Banking, Liberty and Central & Other. The four groups provide banking and financial services to small and medium businesses, as well as corporate, governmental, and parastatal organisations. The company reported revenue of \$8.61bn in 2017, representing a larger than 40% decrease in revenue from the previous financial year. Profits have also decreased by over \$200mn from 2016.

### Bidcorp

South African food sector investment company Bidcorp specialises in development economies on all continents other than North America, according to Forbes. The company, which only came into being after a separation from Bidvest in 2016, declared an annual revenue of \$9.43bn in 2017. Despite being based in Johannesburg and solely listed on the JSE, only 8% of Bidcorp revenue originates in South Africa, writes Amelia Morgenrood for IOL's Business Report. "The group partners with responsible suppliers which allow it to bring a broad range of product solutions to suit its customers' needs. Sustainability and food safety are major themes and adherence to industry regulations helps mitigate risk for its customers."

### Shoprite Holdings

Brackenfell-based retail giant, Shoprite Holdings reported a net revenue of \$9.45bn in 2017, a marginal increase over the \$9.21bn earned the previous year. Shoprite blamed deflation for the meagre 6.3% growth in revenue over the last two quarters of 2017, compared to the 14% increase achieved in the same period of 2016. The company operates retail brands Shoprite, Checkers, Checkers Hyper, Usave and Hungry Lion both in and out of South Africa. With 137,775 employees on payroll as of 2017.

## MTN Group

South African telecommunications company MTN Group reported a net revenue of \$10.07bn in 2017. This represents a \$1.5bn decrease in revenue over the previous year, continuing a trend of dwindling sales leading back five years to a high point of \$16.78bn in 2012. MTN also experienced a financial loss of \$177.9mn, although the company's asset portfolio has shrunk by less than \$500mn. The company hopes to move forward into 2018 by investing in cutting-edge internet services. MTN successfully launched the first 5G network in South Africa this January, achieving speeds of over 20Gbit/s. "This is the highest achieved on a mobile network in Africa," MTN said in a statement.

## Sasol

Johannesburg-based chemical manufacturer Sasol Ltd. achieve the highest net revenue of any African company in 2017, with a reported \$11.79bn. While this represents a decrease in sales of over \$1.5bn in comparison to 2016, Sasol Ltd expanded its asset portfolio by over \$3bn, bringing the value of the company's holdings to a ten-year high. Sasol produces liquid fuels, chemicals and low-carbon electricity products for the domestic and global market through four subsidiary units: South African Energy Cluster, International Energy Cluster, Chemical Cluster, and Other businesses, Forbes reports .

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